



Arizona's Common Core Standards

English Language Arts and Literacy in Science and Technical Subjects

Explanations and Examples

Grades 11-12

ARIZONA DEPARTMENT OF EDUCATION
HIGH ACADEMIC STANDARDS FOR STUDENTS

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Grades 11-12: Literacy in Science and Technical Subjects

Introduction to Reading Standards

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 and technical subjects 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 – Explanations and Examples

Reading Standards for Literacy in Science and Technical Subjects (RST)

Key Ideas and Details

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.RST.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.</p>	<p>Students examine the details of scientific or technical text to support their analysis of the document or extrapolate a claim made in the text to an example outside of the text. 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. Students should pay particular attention to any gaps or inconsistencies in the information presented.</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 articles about the laws of motion at both macroscopic and subatomic scales. Cite specific evidence in the articles to support the argument that Newton's second law predicts changes in the motion of macroscopic objects, but requires revision for subatomic scales or for speeds close to the speed of light. <i>SCHS-S5C2-04; SCHS-S5C5-03</i> • Read two or more articles about the Big Bang theory. Cite specific evidence in the articles that support the authors' explanations for the origin of the universe. Identify any gaps or inconsistencies between the texts. <i>SCHS-S6C4-01</i>

Reading Standards for Literacy in Science and Technical Subjects (RST)

Key Ideas and Details *continued*

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.RST.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.</p>	<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, and flow chart) of a sequence or complex process (e.g., protein synthesis, chemical reactions, and transfer of energy) from the text summary.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read an article on the role of radioactive decay of unstable isotopes in generating new energy within Earth's crust and mantle. Summarize the process of mantle convection and how it drives plate tectonics using words, pictures, and/or diagrams. <i>SCHS-S6C2-04</i> • 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. <i>SCHS-S6C1-06</i> • 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 (<i>SCHS-S5C4-12</i>) or analyzing calorimetric measurements (<i>SCHS-S5C5-06</i>).
<p>11-12.RST.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.</p>	<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 and look for initial trends and use statistical tools to analyze results. 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 collecting calorimetric measurements of matter, paying attention to the safety precautions and type of preparation needed to test a variety of different types of matter (food, water, paraffin, and NaOH). <i>SCHS-S5C5-06</i> • Follow written procedures for determining the concentration of acids and bases, demonstrating proper techniques and safety precautions. <i>SCHS-S5C4-12; SCHS-S1C2-01</i>

Reading Standards for Literacy in Science and Technical Subjects (RST)

Craft and Structure

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.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 11–12 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 and interpret geologic time scales, and then identify the linguistic roots and affixes to help clarify the meanings of terms related to chronostratigraphy (eons: Phanerozoic, Proterozoic; eras: Cenozoic, Mesozoic; periods: Neogene, Paleogene; etc.). <i>SCHS-S6C3-04</i> • Determine the meaning of chemical equations containing chemical formulas, coefficients, and symbols that represent the states of the reactants and products. <i>SCHS-S5C4-03</i> • Determine the meaning of variables in mathematical equations, such as $f=ma$ (<i>SCHS-S5C2-04</i>), $PV=nRT$ (<i>SCHS-S5C5-05</i>), or $V=IR$ (<i>SCHS-S5C5-06</i>).
<p>11-12.RST.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</p>	<p>Students identify different structures within a text (headings, sub-headings, bold words, pictures, graphs, data tables, and 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 and how the sequencing of the information within a text to enhance the understanding of the specific terms along with the general science idea.</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. Analysis may include creating a graphic organizer showing the organizational structure of the text or identifying relationships between major topics within 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.



Reading Standards for Literacy in Science and Technical Subjects (RST)

Craft and Structure *continued*

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.RST.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.</p>	<p>Students will analyze the author's purpose for writing the text and identify unresolved issues or questions created or posed in the reading.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read a science article that describes the procedure for measuring seismic waves and then analyze why the author included the procedure in the text and how that procedure would address the author's research question. <i>SCHS-S6C2-06</i> • Read about different global climate models and compare each author's perspective and purpose for the text. Compare the physical and chemical processes included in each model and analyze the strengths and weaknesses of each model based on the included properties. Explain why the authors included each type of information in their model. Identify other considerations that should be included in the models. <i>SCHS-S6C2-17</i>



Reading Standards for Literacy in Science and Technical Subjects (RST)

Integration of Knowledge and Ideas

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.RST.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.</p>	<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, product information or safety sheets, video, or other forms of media. Students should be able to develop a written or oral explanation or a visual representation (graph, chart, picture, etc.) that accurately represents the information presented; or vice versa. Students should also be able to compare multiple media representations of the same information (e.g., quantitative data, video, and multimedia) and explain how these multiple representation may or may not produce similar results.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read text describing the luminosity, color, and temperature of various stars and show the relative position of each star on a Hertzsprung-Russell diagram. <i>SCHS-S6C4-03</i> • 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. <i>SCHS-S6C2-10</i> • Investigate the feasibility of desalination for reclaiming water. After reading text about water desalination, watch a video about water desalination. Compare the information provided by the video to the text and determine which information from each source better addresses the research question. <i>SCHS-S6C1-05; SCHS-S3C2-05</i>

Reading Standards for Literacy in Science and Technical Subjects (RST)

Integration of Knowledge and Ideas *continued*

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.RST.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.</p>	<p>Students use multiple sources of information to evaluate scientific research or reports, analyzing experimental design, data collection methods and analysis, and conclusions.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Read an article about water reclamation and conservation, then analyze the relevance of the evidence provided and the reasoning the author used to support the claim, identify variables in the hypothesis, trends indicated by the data, and conclusions drawn. Explain how the text relates to the current body of science knowledge. <i>SCHS-S1C3-03</i> • 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. <i>SCHS-S3C1-02; ETHS-S3C2-03</i> • 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. Compare to published studies to determine the validity of experimental design and the accuracy of data collection and analysis. <i>SCHS-S1C3-03; ETHS-S3C2-03</i>
<p>11-12.RST.9. Synthesize information from a range of sources (e.g., texts, experiments, and simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>	<p>Students extract information from multiple sources and synthesize information to create an understanding that is aligned with current scientific explanations and understanding.</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, and/or an educational website) that provides information about the same Earth processes. Use the information from each source to develop understanding of these Earth processes. Determine whether the information in the compared sources supports or contradicts each other. <i>SCHS-S6C1-02</i> • Perform a series of experiments that show evidence of chemical reactions (precipitate, gas, color change, and change in temperature). After collecting data, read text that describes different chemical reactions and the types of evidence of the reaction. Use the information conveyed by the experiment and that contained in the text to 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. <i>SCHS-S5C4-02</i> • Read historic experiments investigating the structure of the atom. Use these past studies and models to develop a coherent understanding of atomic structure and compare your understanding to that of current accepted understandings of atomic structure. <i>SCHS-S5C1-08; SCHS-S2C2-02; ETHS-S3C1-02; ETHS-S3C2-04</i>



Reading Standards for Literacy in Science and Technical Subjects (RST)

Range of Reading and Level of Text Complexity

Standards

Students are expected to:

11-12.RST.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

Explanations and Examples

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 11-12 complexity band.



Grades 11-12: Literacy in Science and Technical Subjects Explanations and Examples

Introduction to Writing Standards

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college and career ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first draft text under a tight deadline and the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and long time frames throughout the year.

Writing Standards for Literacy in Science and Technical Subjects – Explanations and Examples

Writing Standards for Literacy in Science and Technical Subjects (WHST)

Text Types and Purposes

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.WHST.1. Write arguments focused on <i>discipline-specific content</i>.</p> <p>a. 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.</p> <p>b. 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.</p> <p>c. 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.</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"> Construct an argument to support claims for how Newton's second law predicts changes in the motion of macroscopic objects, but requires revision for subatomic scales or for speeds close to the speed of light. <i>SCHS-S5C2-04; SCHS-S5C5-03</i> Write a multi-paragraph scientific argument stating a claim to answer the prompt, "How does the Big Bang explain the evolution of universes?" Support your claim by citing evidence from texts or other media sources. <i>SCHS-S6C4-01</i> After completing an experiment that compared conservation of momentum in collision and recoil situations, write a conclusion that supports or refutes the statement "Total momentum is conserved in both collision and recoil situations." and provide quantitative evidence to support the claim with the experimentally collected data in addition to other existing research. <i>SCHS-S5C2-14</i>

Writing Standards for Literacy in Science and Technical Subjects (WHST)

Text Types and Purposes *continued*

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.WHST.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</p> <ol style="list-style-type: none"> 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, tables), and multimedia when useful to aiding 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). 	<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. The product may include research papers, laboratory reports, functional text, or informative essays and should be written in an academic voice appropriate for the type of writing and the audience.</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. <i>SCHS-S3C2-04; SCHS-S4C5-05</i> Write a research paper documenting the history of model of the atom (<i>SCHS-S5C1-07</i>) or other historical advancements in science, like the discovery of the structure of DNA (<i>SCHS-S2C1-02</i>). Following a lab investigation that explores factors that affect energy transfer between two samples of water, write a lab report that includes an abstract or background information, a hypothesis, a description of procedures, observations, qualitative and/or quantitative data, an analysis and conclusion, including any claims that can be made from those observations and evidence that supports the claim. <i>SCHS-S5C3-02</i> Write an informative essay that explains how radioactive decay maintains the Earth's internal temperature. <i>SCHS-S6C2-08</i>



Writing Standards for Literacy in Science and Technical Subjects (WHST)

Text Types and Purposes *continued*

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.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 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>Examples:</p> <ul style="list-style-type: none"> • Write a step-by-step procedure showing safe and correct use of a balance, Bunsen burner, or calorimeter as part of a lab report. <i>SCHS-S1C2-01</i> • Design and test a mathematical or computer-based model showing the cause and/or effects of climate changes over long periods of time (<i>SCHS-S6C2-16</i>). Write a technical report that includes a description of the model design (assumptions, calculations, and limitations), appropriate sources and displays of the test data, and explains how preliminary test data was used to refine the model.

Writing Standards for Literacy in Science and Technical Subjects (WHST)

Production and Distribution of Writing

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.WHST.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <ul style="list-style-type: none"> Produce clear and coherent functional writing (e.g., formal letters, envelopes, technical directions, experiments, labels, timelines, graphs/tables, procedures, charts, maps, captions, diagram, sidebar, and flow chart) in which the development, organization and style are appropriate to task, purpose, and audience. 	<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. <i>SCHS-S1C4</i> Write a report that includes timelines for historical developments in science, such as the history of the Periodic Table of Elements (<i>SCHS-S2C1-02; SCHS-S5C1-03</i>) or includes a decision flow chart for evaluating methods used to manage natural resources (<i>SCHS-S3C2-05</i>). Write a letter to the head of the local power company suggesting ways to increase the use of solar power in Arizona. Cite quantitative and/or qualitative evidence from multiple sources to support your suggestions. <i>SCHS-S3C2-01</i>
<p>11-12.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>11-12.WHST.6. 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.</p>	<p>This standard requires the use of technology (Internet, keyboarding skills, formatting, and 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.

Writing Standards for Literacy in Science and Technical Subjects (WHST)

Research to Build and Present Knowledge

<u>Standards</u> <i>Students are expected to:</i>	<u>Explanations and Examples</u>
<p>11-12.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, and 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"> • Research the history of the periodic table and determine why Mendeleev's period table was adopted as the official periodic table by IUPAC. Synthesize relevant information from multiple sources to construct claims, evidence, and explanations supporting the research or published information. <i>SCHS-S2C1-02; SCHS-S5C1-03</i> • 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. <i>SCHS-S6C2-15</i>
<p>11-12.WHST.8. 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.</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, and 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 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 effect on matter that different wavelengths of electromagnetic radiation have, gather relevant information on different types of long and short wavelength electromagnetic radiation, conversion to thermal energy, and effects on living cells. Integrate relevant information and appropriate citations from those sources in the written introduction, background information, and/or analysis of the student-conducted research project. <i>SCHS-S5C5-07</i> • 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. <i>SCHS-S6C2-02</i>



Writing Standards for Literacy in Science and Technical Subjects (WHST)

Research to Build and Present Knowledge *continued*

Standards

Students are expected to:

11-12.WHST.9. Draw evidence from informational texts to support analysis, reflection, and research.

Explanations and Examples

Students should be given multiple opportunities to use evidence from informational texts (e.g., research papers, credible web sites, journal articles, and textbooks) to support their claims, analyses, reflections, and/or research.

Examples:

- Following a lab aligned to the grade level Science Standard, 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 Science and Technical Subjects (WHST)

Range of Writing

Standards

Students are expected to:

11-12.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.

Explanations and Examples

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, and research projects).

Examples:

- Write short explanations of tables or graphs to demonstrate understanding of the displayed data (population graphs, geological timelines, data tables, and 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, and 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.