

Integration of English language Arts and Science and Engineering Practices in grades 9 through 12

Introduction

Developing literacy skills within specific content areas is an important life skill for students as they prepare to be college and career ready. The mutually supportive nature of the New Jersey Student Learning Standards for English Language Arts (NJSLS-ELA) and the New Jersey Student Learning Standards for Science (NJSLS-S) makes their integration an opportunity for students to develop proficiencies in both disciplines simultaneously. This document focuses on leveraging the connections between NJSLS-ELA Anchor Standards and the Science and Engineering Practices in grades 9 through 12.

The Science and Engineering Practices are an essential component of the NJSLS-S because students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn nor show competence in practices except in the context of specific core ideas (NRC Framework, 2012, p. 218). The practices reflect the non-linear nature of science and engineering. See Figure 1: Science and Engineering Practices on page 2.

We use the term “practices” instead of a term such as “skills” to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice (NRC Framework, 2012, p. 30).

Every effort has been made to ensure consistency between the NJSLS-ELA and the NJSLS-S. As is the case with the mathematics standards, NJSLS-S should always be interpreted and implemented in such a way that they do not outpace or misalign to the grade-by-grade standards in the NJSLS-ELA. What follows are the NJSLS-S Science and Engineering Practices and the corresponding NJSLS-ELA Literacy Anchor Standards, explanations of how the two disciplines integrate, examples of the integration from the Model Science Curriculum Framework and connections to how the integration looks in the professional world.

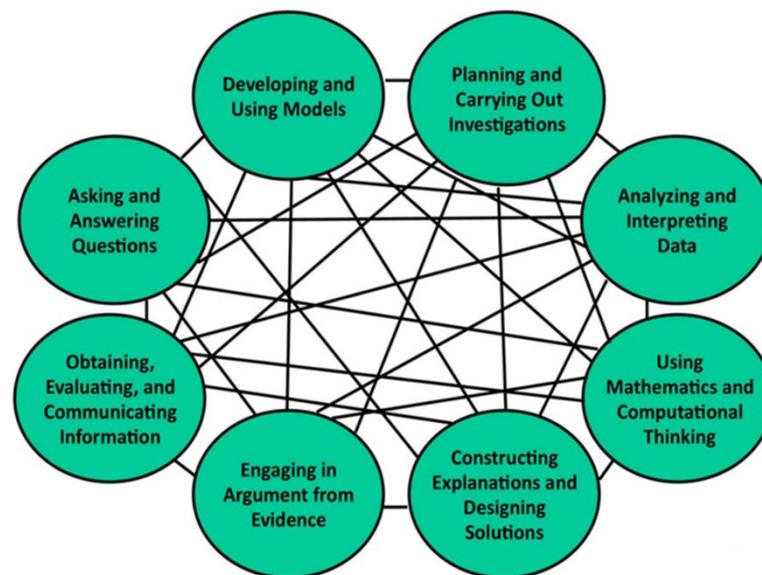


Figure 1: The Interrelationship of the Science and Engineering Practices

Part 1: Asking Questions and Defining Problems

Students at any grade level should be able to ask questions of each other about the texts they read, the features of the phenomena they observe and the conclusions they draw from their models or scientific investigations. For engineering, they should ask questions to define the problem to be solved and to elicit ideas that lead to the constraints and specifications for its solution ([NRC Framework 2012, p. 56](#)). View this video that summarizes [Asking Questions and Defining Problems](#).

Asking Questions and Defining Problems in Grades 9 through 12:

- Ask questions
 - That arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.
 - That arise from examining models or a theory, to clarify and/or seek additional information and relationships.
 - To determine relationships, including quantitative relationships, between independent and dependent variables.
 - To clarify and refine a model, an explanation, or an engineering problem.
- Evaluate a question to determine if it is testable and relevant.
- Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory.
- Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design.
- Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environment.

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NJSLS-ELA Anchor Standard Reading 1: Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Integration with Asking Questions and Defining Problems: Evidence plays a critical role in the kinds of questions asked, information gathered and findings reported in science and technical texts. The notion of close reading in Reading Standard 1 emphasizes the use of asking and refining questions in order to answer them with evidence that is either explicitly stated or implied.

Reading Anchor 1 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. RST.9-10.1. 	<ul style="list-style-type: none"> Make connections to other texts and or/make global connections, where relevant. Identify and use explicit and implicit textual evidence. Distinguish the difference between strong and insufficient details. Distinguish text that provides strong support from text that is unsupported. Support inference using several examples from the text. Use direct quotes, paraphrase and summarize objectively. 	<ul style="list-style-type: none"> Cite specific textual evidence to support an explanation for the cycling of matter and flow of energy in aerobic and anaerobic conditions, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. Biology, Unit 1
<ul style="list-style-type: none"> Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for 	<ul style="list-style-type: none"> Make connections to other texts and/or global connections when relevant. 	<ul style="list-style-type: none"> Cite specific textual evidence to support the claim that Newton's second law of motion describes the mathematical relationship among

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NJSL-ELA Indicators	Students...	Example
explanations or descriptions. RST.11-12.1.	<ul style="list-style-type: none">• Analyze text and identify explicit and implicit textual evidence.• Determine the difference between strong and insufficient details.• Cite evidence and use direct quotes, paraphrase or objectively summarize.• Evaluate the relationship between explicit and implicit details and how they contribute to the meaning of the text.	the net force on a macroscopic object, its mass, and its acceleration. Physics, Unit 1

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Closely read and analyze text like lab reports, technical manuals and research
- Infer meaning from text
- Question information presented in text
- Determine when more information is needed
- Use information from text to support assertions
- Cite textual information from several sources
- Evaluate information in text

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NJSLS-ELA Anchor Standard Reading 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Integration with Science and Engineering Practice: Scientists and engineers present data in a myriad of visual formats in order to reveal meaningful patterns and trends. Reading Standard 7 speaks directly to the importance of asking questions about and evaluating data presented in different formats.

Reading Anchor 7 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. RST.9-10.7. 	<ul style="list-style-type: none"> Critically examine the information presented in both written and visual form. Create a visual form of information or data presented in written form. Interpret visual or mathematical information into written form. 	<ul style="list-style-type: none"> Translate information from the periodic table about the patterns of electrons in the outermost energy level of atoms into words that describe the relative properties of elements. Chemistry, Unit 1
<ul style="list-style-type: none"> 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. RST.11-12.7. 	<ul style="list-style-type: none"> Compare, contrast and assess how information from various sources is expressed in multiple mediums. Analyze how the information presented in each source expressed in different mediums affects the overall message. Use references to the different sources to answer a question or to solve a problem. 	<ul style="list-style-type: none"> Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. Physics, Unit 6

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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine the best representation for information
- Read a variety of charts and graphs
- Create charts and graphs from text
- Explain information presented in charts and graphs
- Determine the necessary information from visual representations
- Evaluate information in text

NJSLS-ELA Anchor Standards Reading 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

Integration with Asking Questions and Defining Problems: Challenging or clarifying scientific hypotheses, arguments, experiments or conclusions—and the evidence and premises that support them—are key to this practice. Reading Standard 8 emphasizes evaluating the validity of arguments and whether the evidence offered backs up the claims logically.

Reading Anchor 8 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none">• Determine if the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. RST.9-10.8.	<ul style="list-style-type: none">• Evaluate whether the reasoning an author uses is logical or legitimate and if the evidence that is used is relevant to the claim or provides enough proof.• Use strong textual support to pinpoint any statements that are false and judge if any of the author’s reasoning is misleading.	<ul style="list-style-type: none">• Assess the extent to which the claim that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem, is supported by

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NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> Evaluate what a reliable source is and what makes one questionable. Evaluate evidence and reasoning to solve a problem. 	reasoning and evidence. Biology, Unit 2
<ul style="list-style-type: none"> 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. RST.11-12.8. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis and conclusions in a text. Verify information presented in a text when possible. Validate or contest conclusions using other sources as support. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text relating that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other, verifying the data when possible and corroborating or challenging conclusions with other sources of information. Physics, Unit 7

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine if given information is valid
- Question hypotheses, data and conclusions
- Verify that information is correct
- Support analysis of hypotheses, data and conclusions with sources

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NJSLS-ELA Anchor Standards Writing 7: Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.

Integration with Asking Questions and Defining Problems: Generating focused questions and well-honed scientific inquiries are key to conducting investigations and defining problems. The research practices reflected in Writing Standard 7 reflect the skills needed for successful completion of such research-based inquiries.

Writing Anchor 7 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. WHST.11-12.7. 	<ul style="list-style-type: none"> Explore inquiry topics through both short and more sustained research projects. Conduct research drawing on multiple sources to solve a problem. Develop an inquiry question. Refocus inquiry/generate additional questions when appropriate. Know how to broaden or narrow an inquiry. Synthesize and summarize information. Show understanding of the topic being investigated. 	<ul style="list-style-type: none"> Conduct short as well as more sustained research projects to determine the forces between objects and the changes in energy of the objects as they interact through electric or magnetic fields; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the interaction of two objects through electric or magnetic fields, demonstrating understanding of the interaction of two objects through electric or magnetic fields. Physics, Unit 8

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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Create questions to drive investigation
- Broaden or narrow an inquiry when necessary
- Conduct research led by questions
- Appropriately use information discovered in research

NJSLS-ELA Anchor Steaking and Listening 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Integration with Asking Questions and Defining Problems: The ability to pose relevant questions, clarify or elaborate on the ideas of others or request information from others are crucial to learning and conducting investigations in science class. Speaking and Listening Standard 1 speaks directly to the importance of asking and refining questions to clarify ideas that generate solutions and explanations.

Speaking and Listening Anchor 1 with Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none">• Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. SL.9-10.1.	<ul style="list-style-type: none">• Prepare for discussions by reading or researching material under study.• Refer to evidence on the topic, text or issue to pose salient questions.• Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas.• Propel conversations by posing and responding to questions.	<ul style="list-style-type: none">• Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Chemistry, Unit 2

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NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> • Actively incorporate others into the discussion. • Clarify, verify or challenge ideas and conclusions. • Summarize points of agreement and disagreement, and justify own views. • Make new connections in light of the evidence and reasoning presented. 	
<ul style="list-style-type: none"> • Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. SL.11-12.1. 	<ul style="list-style-type: none"> • Prepare for discussions by reading or researching material under study. • Refer to evidence on the topic, text or issue to pose salient questions. • Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. • Propel conversations by posing and responding to questions that probe reasoning and evidence. • Clarify, verify or challenge ideas and conclusions. • Promote divergent and creative perspectives. 	<ul style="list-style-type: none"> • Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Capstone, Unit 1A

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NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> • Respond thoughtfully to diverse perspectives. • Synthesize comments, claims, and evidence made on all sides of an issue. • Determine what additional information or research is required to deepen the investigation or complete the task. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Gain information and understanding through verbal discourse
- Pose questions of colleagues to gain insight or understanding
- Use sources to support ideas or conclusion

NJSL-ELA Speaking and Listening Anchor 3: Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric.

Integration with Asking Questions and Defining Problems: Evaluating the soundness of a speaker’s reasoning and evidence concerning scientific theories and concepts through a series of inquiries teaches students to be discriminating thinkers. Speaking and Listening Standard 3 directly asserts that students must be able to critique a point of view from the perspective of the evidence provided and reasoning advanced.

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Speaking and Listening Anchor 3 with Asking Questions and Defining Problems

NJSL-ELA Indicators	Students should be able to...	Example
<ul style="list-style-type: none"> Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any false reasoning or distorted evidence. SL.9-10.3. 	<ul style="list-style-type: none"> Evaluate whether the reasoning a speaker uses is logical/legitimate. Identify false or misleading statements or evidence. Engage as an active listener and participant. Use text/source to show fallibility in speaker’s reasoning. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text about the role of group behavior on individual and species’ chances to survive and reproduce, verifying the data when possible and corroborating or challenging conclusions with other sources of information. Biology, Unit 7
<ul style="list-style-type: none"> Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. SL.11-12.3. 	<ul style="list-style-type: none"> Evaluate whether the reasoning a speaker uses is logical/legitimate and if the evidence is relevant. Identify false or misleading statements or evidence. Use evidence from sources/text to prove fallibility in speaker’s reasoning. Engage as an active listener and participant. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text relating that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other, verifying the data when possible and corroborating or challenging conclusions with other sources of information. Physics, Unit 7

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NJSL-ELA Indicators	Students should be able to...	Example
	<ul style="list-style-type: none">• Consider and assess the speaker's argument, organization, diction and tone.	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Evaluate the validity of scientific theories or research
- Determine if interpretation of data is false or misleading
- Use the research of others during discourse with colleagues

Part 2: Planning and Carrying Out Investigations

Students should have opportunities to plan and carry out several different kinds of investigations during their K-12 years. At all levels, they should engage in investigations that range from those structured by the teacher—in order to expose an issue or question that they would be unlikely to explore on their own (e.g., measuring specific properties of materials)— to those that emerge from students' own questions ([NRC Framework, 2012, p. 61](#)). View this video that summarizes [Planning and Carrying Out Investigations](#).

Planning and Carrying Out Investigations in Grades 9 through 12:

- Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.
- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts.
- Select appropriate tools to collect, record, analyze, and evaluate data.
- Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.
- Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 3: Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Integration with Planning and Carrying out Investigations: Systematic investigations in the field or laboratory lie at the heart of scientific inquiry. Reading Standard 3 emphasizes the importance of accuracy in carrying out such complex experiments and procedures, in following a course of action that will provide the best evidence to support conclusions.

Reading Anchor 3 and Planning and Carrying out Investigations

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. RST.9-10.3. 	<ul style="list-style-type: none"> Closely read all procedures. Ask follow-up questions to clarify. Follow the procedure step by step. Ensure that procedures are executed completely. Determine when changes to the protocol need to be made due to special circumstances. 	<ul style="list-style-type: none"> Students participate in a long term investigation as part of the GLOBE Program which requires rigorous data collection procedures to be followed.
<ul style="list-style-type: none"> 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. RST.11-12.3. 	<ul style="list-style-type: none"> Closely read all procedures. Ask follow-up questions to clarify. Follow the procedure step by step. Ensure that procedures are executed completely. 	<ul style="list-style-type: none"> Analyze multiple sources to inform design decisions. Physics, Unit 1

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NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none">• Determine when changes to the protocol need to be made due to special circumstances.• Interpret the results based on what the text says.	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Carefully read and follow procedures
- Modify procedures when necessary
- Pose questions when steps are unclear
- Interpret the results expected from following a procedure

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Writing 7: Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.

Integration with Writing Anchor 7 with Planning and Carrying out Investigations: Planning and carrying out investigations to test hypotheses or designs is central to scientific and engineering activity. The research practices reflected in [Writing Standard 7](#) reflect the skills needed for successful completion of such research-based inquiry.

Writing Anchor 7 and Planning and Carrying out Investigations

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. WHST.9-10.7. 	<ul style="list-style-type: none"> Explore inquiry topics through both short and more sustained research projects. Develop a thorough research plan to answer a question. Conduct research drawing on multiple sources to solve a problem. Develop an inquiry question. Refocus inquiry/generate additional questions when appropriate. Know how to broaden or narrow an inquiry. Synthesize and summarize information. Show understanding of the topic being investigated. 	<ul style="list-style-type: none"> Gather applicable information from multiple reliable sources to support claims that feedback mechanisms maintain homeostasis. Use 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. Biology, Unit 5

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NJSL-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. WHST.11-12.7. 	<ul style="list-style-type: none"> Explore inquiry topics through both short and more sustained research projects. Develop a thorough research plan to answer a question. Conduct research drawing on multiple sources to solve a problem. Develop an inquiry question. Refocus inquiry/generate additional questions when appropriate. Know how to broaden or narrow an inquiry. Synthesize and summarize information. Show understanding of the topic being investigated. 	<ul style="list-style-type: none"> Conduct short as well as more sustained research projects to support the claim that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. Physics, Unit 8

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Create a plan to test a hypothesis or design
- Follow a carefully thought-out research plan
- Adapt the research plan, when appropriate and necessary

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NJSLS-ELA Anchor Standard Writing 8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

Integration with Planning and Carrying out Investigations: Collecting relevant data across a broad spectrum of sources in a systematic fashion is a key element of this scientific practice. Writing Standard 8 spells out the importance of gathering applicable information from multiple reliable sources to support claims

Writing Anchor 8 and Planning and Carrying out Investigations

NJSLS-ELA Indicators	Students should be able to...	Example
<ul style="list-style-type: none"> 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. WHST.9-10.8. 	<ul style="list-style-type: none"> Gather print and digital information. Assess credibility and accuracy of sources. Assess whether information from reliable and authoritative sources is relevant. Utilize quotations within writing to further claims. Paraphrase correctly. Follow a standard format for citation. 	<ul style="list-style-type: none"> Gather applicable information from multiple reliable sources to support claims that feedback mechanisms maintain homeostasis. Use 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. Biology, Unit 5
<ul style="list-style-type: none"> Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and 	<ul style="list-style-type: none"> Gather grade-appropriate print and digital information. 	<ul style="list-style-type: none"> Gather relevant information from multiple authoritative print and digital sources describing the effects that different frequencies of

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<p>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. WHST.11-12.8.</p>	<ul style="list-style-type: none"> • Consider the sources in terms of task, audience and purpose. • Assess the validity of each source as it pertains to the specific task, purpose and audience. • Assess whether information from reliable and authoritative sources is relevant. • Utilize a variety of sources, not depending on one specific source. • Follow a standard format for citation (MLA, APA, etc.). 	<p>electromagnetic radiation have when absorbed by matter, 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. Physic, Unit 7</p>
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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Collect data from a variety of sources, both print and digital
- Determine if a particular source is relevant
- Determine if the information in a source is reliable and valid

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Speaking and Listening 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.

Integration with Planning and Carrying out Investigations: Carrying out investigations in collaborative settings is crucial to learning in science class and engineering settings. Speaking and Listening Standard 1 speaks directly to the importance of exchanging theories and evidence cooperatively and collaboratively to carrying out investigations.

Speaking and Listening and Planning and Carrying Out Investigations

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. SL.9-10.1. 	<ul style="list-style-type: none"> Prepare for discussions by reading or researching material under study. Refer to evidence on the topic, text or issue to pose salient questions. Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. Collaborate with peers to set rules for discussions. Propel conversations by posing and responding to questions. Actively incorporate others into the discussion. Clarify, verify or challenge ideas and conclusions. 	<ul style="list-style-type: none"> Read the Case Study on page 23.

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Respond thoughtfully to various perspectives. • Summarize points of agreement and disagreement, and justify own views. • Make new connections in light of the evidence and reasoning presented. 	
<ul style="list-style-type: none"> • Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. SL.11-12.1. 	<ul style="list-style-type: none"> • Prepare for discussions by reading or researching material under study. • Refer to evidence on the topic, text or issue to pose salient questions. • Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. • Collaborate with peers to promote civil, democratic discussions. • Propel conversations by posing and responding to questions that probe reasoning and evidence. • Clarify, verify or challenge ideas and conclusions. • Promote divergent and creative perspectives. 	<ul style="list-style-type: none"> • Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Capstone Science, Unit 1A

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Respond thoughtfully to diverse perspectives. • Synthesize comments, claims, and evidence made on all sides of an issue. • Determine what additional information or research is required to deepen the investigation or complete the task. 	

Case Study

The students in a high school Environmental Science course revisit the properties of waves as part of an investigation of sea level rise along the Jersey Shore ([HS-ESS3-6](#)), ([HS-ESS2-2](#)). Because much of the data that scientists use to understand interacting Earth systems comes from satellite data based on different electromagnetic waves, the students choose a type of data and do a research project to learn about a specific technology and how it works.

Teams of students work to answer the question about how waves are used in technologies that benefit society. The students are asked to develop a class list of possible questions to research. Students select a question or questions to investigate with a group of two to four other students. They use the internet to find sources of information, evaluate them for reliability, and synthesize information from multiple sources to describe how the technology works to study things like ocean temperature, ground water movement, vegetation patterns, and weather patterns. Students may need guidance on locating and evaluating online resources; science teachers should collaborate with the teacher librarian to teach these subscription databases ([HS-PS4-5](#)), ([HS-PS4-4](#)).

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Gain information and understanding through verbal discourse
- Pose questions of colleagues to gain insight or understanding
- Use sources to support ideas or conclusion

Part 3: Analyzing and Interpreting Data

Once collected, data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others. Because raw data as such have little meaning, a major practice of scientists is to organize and interpret data through tabulating, graphing, or statistical analysis. Such analysis can bring out the meaning of data—and their relevance—so that they may be used as evidence.

Engineers, too, make decisions based on evidence that a given design will work; they rarely rely on trial and error. Engineers often analyze a design by creating a model or prototype and collecting extensive data on how it performs, including under extreme conditions. Analysis of this kind of data not only informs design decisions and enables the prediction or assessment of performance but also helps define or clarify problems, determine economic feasibility, evaluate alternatives, and investigate failures ([NRC Framework, 2012, p. 61-62](#)). Video summarizing [Analyzing and Interpreting Data](#).

Analyzing and Interpreting Data in Grades 9-12:

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.
- Consider limitations of data analysis (e.g., measurement error, sample selection) when analyzing and interpreting data.
- Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations.
- Evaluate the impact of new data on a working explanation and/or model of a proposed process or system. Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Integration with Analyzing and Interpreting Data: Scientists and engineers present data in a myriad of visual formats in order to reveal meaningful patterns and trends. Reading Standard 7 speaks directly to the importance of understanding and presenting information that has been gathered in various formats to reveal patterns and relationships and allow for deeper explanations and analyses.

Reading Anchor 7 and Analyzing and Interpreting Data

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> 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. RST.9-10.7. 	<ul style="list-style-type: none"> Critically examine the information presented in both written and visual form. Create a visual form of information or data presented in written form. Interpret visual or mathematical information into written form. 	<ul style="list-style-type: none"> Integrate and evaluate global climate change data from multiple sources to reveal patterns and relationships and forecast current rate of global or regional climate change and associated future impacts. Biology, Unit 3
<ul style="list-style-type: none"> 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. RST.11-12.7. 	<ul style="list-style-type: none"> Compare, contrast and assess how information from various sources is expressed in multiple mediums. Analyze how the information presented in each source expressed in different mediums affects the overall message. 	<ul style="list-style-type: none"> Integrate and evaluate multiple sources of information presented in diverse formats and media to describe energy conversions as energy flows into, out of, and within systems. Physics, Unit 4

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none">• Use references to the different sources to answer a question or to solve a problem.	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine the best representation for information
- Read a variety of charts and graphs
- Create charts and graphs from text
- Explain information presented in charts and graphs
- Determine the necessary information from visual representations
- Evaluate information in text

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 9: Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Integration with Analyzing and Interpreting Data: Scientists and engineers use technology to allow them to draw on multiple sources of information in order to create data sets. **Reading Standard 9** identifies the importance of analyzing multiple sources in order to inform design decisions and create a coherent understanding of a process or concept.

Reading Anchor 9 and Analyzing and Interpreting Data

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> 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. RST.9-10.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Determine the similarities and differences between information presented in different formats. Analyze points of comparison and contrast. Decipher contradictory information. 	<ul style="list-style-type: none"> Compare different sources of information describing energy conversions to create a coherent understanding of energy flows into, out of, within, and between systems. Physics, Unit 4
<ul style="list-style-type: none"> Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. RST.11-12.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Blend information from a range of sources presented in different formats. Create a clear understanding of the content of a variety of sources. 	<ul style="list-style-type: none"> Synthesize data from multiple sources of information in order to create data sets that inform design decisions and create a coherent understanding of developing, managing, and utilizing energy resources. Capstone Science, Unit 6

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> Identify contradictory information and rectify contradictions. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Analyze multiple sources to create data sets
- Use information from multiple sources to inform future work

NJSLS-ELA Anchor Standard Listening 2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

Integration with Analyzing and Interpreting Data: Central to the practice of scientists and engineers is integrating data drawn from multiple sources in order to create a cohesive vision of what the data means. Speaking and **Listening Standard 2** addresses the importance of such synthesizing activities to building knowledge and defining and clarifying problems. This includes evaluating the credibility and accuracy of data and identifying possible sources of error.

Speaking and Listening Anchor with Analyzing and Interpreting Data

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. SL.9-10.2. 	<ul style="list-style-type: none"> Evaluate the credibility and accuracy of sources in diverse formats. Evaluate whether the speaker's reasoning is logical/legitimate and if the evidence is relevant. Engage as an active listener and participant. 	<ul style="list-style-type: none"> Use evidence from multiple sources to clearly communicate an explanation for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large, carbon-based molecules. Chemistry, Unit 4

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> Use text/source to show fallibility in speaker's reasoning. 	
<ul style="list-style-type: none"> Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. SL.11-12.2. 	<ul style="list-style-type: none"> Evaluate the credibility and accuracy of sources in diverse formats. Evaluate whether the speaker's reasoning is logical/legitimate and if the evidence is relevant. Identify false statements or evidence, judging if any of the speaker's reasoning is misleading. Engage as an active listener and participant. Use text/source to show fallibility in speaker's reasoning. 	<ul style="list-style-type: none"> Integrate and evaluate multiple sources of information presented in diverse formats and media in order to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Physics, Unit 1

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Use sources in diverse formats to present information
- Determine if a presenter's information is valid
- Disprove illogical or faulty reasoning
- Provide proof to disprove faulty logic

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Speaking and Listening 5: Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Integration with Analyzing and Interpreting Data: Presenting data for the purposes of cross-comparison is essential for identifying the best design solution or scientific explanation. Speaking and Listening Standard 5 stresses the importance of visual displays of data within presentations in order to enhance understanding of the relevance of the evidence. That way others can make critical decisions regarding what is being claimed based on the data.

Speaking and Listening Standard 5 with Analyzing and Interpreting Data

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest. SL.9-10.5. 	<ul style="list-style-type: none"> Engage audience and enhance their understanding of findings, reasoning, and evidence by incorporating digital media such as textual, graphical, audio, visual, or interactive elements. 	<ul style="list-style-type: none"> Make strategic use of digital media in presentations to enhance understanding of the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Biology, Unit 5
<ul style="list-style-type: none"> Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest. SL.11-12.5. 	<ul style="list-style-type: none"> Consider, determine and apply the most strategic use of digital media. Engage audience and enhance their understanding of findings, reasoning, and evidence by incorporating digital media such as textual, graphical, audio, visual, or interactive elements. 	<ul style="list-style-type: none"> Make strategic use of digital media in presentations to enhance understanding of the notion that energy is a quantitative property of a system and that the change in the energy of one component in a system can be calculated when the change in energy of the other component(s) and energy flows in and out of the system are known. Capstone Science, Unit 6

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Present information in a clear, concise format
- Utilize diverse media formats to present findings and research

Part 4: Constructing Explanations and Designing Solutions

The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories ([NRC Framework, 2012, p. 52](#)). Video summary of [Constructing Explanations and Designing Solutions](#).

Constructing explanations (for science) and designing solutions (for engineering) in Grades 9 through 12:

- Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables.
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.
- Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
- Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 1: Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

Integration with Constructing Explanations and Designing Solutions: Evidence plays a critical role in determining a theory in science and a design solution in engineering. The notion of close reading in **Reading Standard 1** emphasizes pursuing investigations into well-supported theories and design solutions on the basis of evidence that is either explicitly stated or implied.

Reading Anchor 1 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. RST.9-10.1. 	<ul style="list-style-type: none"> Make connections to other texts and or/make global connections, where relevant. Identify and use explicit and implicit textual evidence. Distinguish the difference between strong and insufficient details. Distinguish text that provides strong support from text that is unsupported. Support inference using several examples from the text. Use direct quotes, paraphrase and summarize objectively. 	<ul style="list-style-type: none"> Cite specific textual evidence to support analysis of science and technical texts supporting explanations of factors that affect carrying capacity of ecosystems at different scales, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. Biology, Unit 2
<ul style="list-style-type: none"> Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, 	<ul style="list-style-type: none"> Make connections to other texts and/or global connections when relevant. 	<ul style="list-style-type: none"> Cite textual evidence to support analysis of science and technical texts describing the effects that different

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
attending to precise details for explanations or descriptions. RST.11-12.1.	<ul style="list-style-type: none"> Analyze text and identify explicit and implicit textual evidence. Determine the difference between strong and insufficient details. Cite evidence and use direct quotes, paraphrase or objectively summarize. Evaluate the relationship between explicit and implicit details and how they contribute to the meaning of the text. 	frequencies of electromagnetic radiation have when absorbed by matter, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. Physics, Unit 7

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Closely read and analyze text like lab reports, technical manuals and research
- Infer scientific theory or design solution from text
- Use explicit or implicit text details to support a theory or a design
- Determine when more information is needed
- Cite textual information from several sources

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

Integration with Constructing Explanations and Designing Solutions: Part of the power of a scientific theory or engineering design is its ability to be cogently explained. That ability to determine and clearly state an idea lies at the heart of **Reading Standard 2**.

Reading Anchor 2 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Determine the central ideas, themes, 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. RST.9-10.2. 	<ul style="list-style-type: none"> Evaluate the central idea. Analyze how details develop the central idea. Make inferences using implicit and explicit textual evidence. Use the text to draw conclusions about the central idea. Formulate an objective summary of the text. Determine how the central idea emerges and is refined or strengthened through key details. 	<ul style="list-style-type: none"> While analyzing scientific research related to feedbacks in the Earth system, students 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. Capstone Science, Unit 3
<ul style="list-style-type: none"> Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by 	<ul style="list-style-type: none"> Determine two or more central ideas in a text. Recognize supporting details for central ideas. 	<ul style="list-style-type: none"> Determine the central ideas or conclusions of a text about changes to Earth's surface changes and their effects on Earth systems; summarize complex concepts, processes, or

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
<p>paraphrasing them in simpler but still accurate terms. RST.11-12.2.</p>	<ul style="list-style-type: none"> • Analyze central ideas as it develops over the course of the text. • Make inferences through the use of details regarding the thematic development. • Use the text to draw conclusions. • Examine how the interaction of central ideas create the overall meaning of the text. • Construct an objective summary of the text. 	<p>information presented in a text describing Earth's surface changes and their effects on Earth systems by paraphrasing them in simpler but still accurate terms. Physics, Unit 5</p>

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine the central idea of scientific text
- Support the explanation of the central idea with details
- Objectively summarize text, free of personal bias

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

Integration with Constructing Explanations and Designing Solutions: Constructing theories and designing solutions both require analysis that is rooted in rational argument and in evidence stemming from an understanding of the world. Reading Standard 8 emphasizes evaluating the validity of arguments and whether the evidence offered backs up the claim logically.

Reading Anchor 8 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Determine if the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. RST.9-10.8. 	<ul style="list-style-type: none"> Evaluate whether the reasoning an author uses is logical or legitimate and if the evidence that is used is relevant to the claim or provides enough proof. Use strong textual support to pinpoint any statements that are false and judge if any of the author’s reasoning is misleading. Evaluate what a reliable source is and what makes one questionable. Evaluate evidence and reasoning to solve a problem. 	<ul style="list-style-type: none"> Assess the extent to which the claim that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem, is supported by reasoning and evidence. Biology, Unit 2
<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis and conclusions in a text. Verify information presented in a text when possible. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a scientific or technical text in order to refine a device that minimizes the force on a

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Indicators	Students...	Examples
challenging conclusions with other sources of information. RST.11-12.8.	<ul style="list-style-type: none"> Validate or contest conclusions using other sources as support. 	macroscopic object during a collision. Physics, Unit 1

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine if given information is valid
- Question hypotheses, data and conclusions
- Verify that information is correct
- Support analysis of hypotheses, data and conclusions with sources

NJSLS-ELA Anchor Standard Writing 2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Integration with Constructing Explanations and Designing Solutions: Generating focused questions and well-honed scientific inquiries are key to conducting investigations and defining problems. The research practices reflected in Writing Standard 7 reflect the skills needed for successful completion of such research-based inquiries.

Writing Anchor 2 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-10.2. 	<ul style="list-style-type: none"> Integrate multimedia when appropriate and effective. Use relevant and sufficient facts, definitions, details, and quotes. Use sources that are appropriate to task, audience, and purpose. 	<ul style="list-style-type: none"> Write an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties of elements using well-chosen,

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Choose precise words and domain-specific vocabulary. • Introduce a topic arranging ideas, concepts, and information to show interrelationships. • Use transitions to link together the major sections of the text. • Write a concluding paragraph or section that supports the information presented. • Choose a formal style and objective tone. • Incorporate facts, definitions, details, quotations and other information as needed. 	<p>relevant, and sufficient facts; extended definitions; and concrete details from students' own investigations, models, theories, simulations, and peer review. Chemistry, Unit 1</p>
<ul style="list-style-type: none"> • Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.11-12.2. 	<ul style="list-style-type: none"> • Effectively select, organize and analyze content. • Use sources that are appropriate to task, audience, and purpose. • Use relevant and sufficient facts, definitions, details, and quotes. • Examine and communicate complex ideas, concepts or information clearly and accurately. • Introduce a topic by arranging ideas, concepts and information to show interrelationships. 	<ul style="list-style-type: none"> • Write informative texts about the ages of crustal rocks based on evidence of past and current movements of continental and oceanic crust, including the narration of historical events, scientific procedures/experiments, or technical processes. Physics, Unit 5

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Choose a formal style and objective tone. • Choose precise words, domain-specific vocabulary, and figurative language, such as similes, metaphors, and analogies. • Incorporate analysis of textual evidence to further content. • Provide multimedia when useful. • Use transitions and syntax to link together the major sections of the text. • Write a concluding paragraph or section that supports the information presented. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly explain information to a variety of audiences
- Use the research of others to support their theories and ideas
- Use multimedia to aid in explanation

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Writing 8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

Integration with Constructing Explanations and Designing Solutions: Collecting relevant data across a broad spectrum of sources in a systematic fashion is a key element of this scientific practice. Writing Standard 8 spells out the importance of gathering applicable information from multiple reliable sources to support claims.

Writing 8 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> 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. WHST.9-10.8. 	<ul style="list-style-type: none"> Gather print and digital information. Assess credibility and accuracy of sources. Assess whether information from reliable and authoritative sources is relevant. Utilize quotations within writing to further claims. Paraphrase correctly. Follow a standard format for citation. 	<ul style="list-style-type: none"> Gather applicable information from multiple reliable sources to support claims that feedback mechanisms maintain homeostasis. Use 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. Biology, Unit 5
<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Gather grade-appropriate print and digital information. Consider the sources in terms of task, audience and purpose. 	<ul style="list-style-type: none"> Gather relevant information on the interaction of two objects through electric or magnetic fields from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
<p>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. WHST.11-12.8.</p>	<ul style="list-style-type: none"> • Assess the validity of each source as it pertains to the specific task, purpose and audience. • Assess whether information from reliable and authoritative sources is relevant. • Utilize a variety of sources, not depending on one specific source. • Follow a standard format for citation (MLA, APA, etc.). 	<p>limitations of each source in terms of the development of a model to illustrate the forces between objects and the changes in energy of the objects as they interact through electric or magnetic fields; integrate information into text describing the interaction of two objects through electric or magnetic fields selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. Physics, Unit 8</p>

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Collect data from a variety of sources, both print and digital
- Determine if a particular source is relevant
- Determine if the information in a source is reliable and valid

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Writing 9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

Integration with Constructing Explanations and Designing Solutions: The route towards constructing a rigorous explanatory account centers on garnering the necessary empirical evidence to support a theory or design. That same focus on generating evidence that can be analyzed is at the heart of Writing Standard 9.

Writing 9 and Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Draw evidence from informational texts to support analysis, reflection, and research. WHST.9-10.9. 	<ul style="list-style-type: none"> Assess soundness of reasoning and relevance of textual evidence to support analysis, reflection, and research. Utilize evidence to support analysis, reflection and research. 	<ul style="list-style-type: none"> Draw evidence from informational texts to support analysis, reflection, and research about how natural selection leads to adaptation of populations. Biology, Unit 7
<ul style="list-style-type: none"> Draw evidence from informational texts to support analysis, reflection, and research. WHST.11-12.9. 	<ul style="list-style-type: none"> Assess soundness of reasoning and relevance of textual evidence to support analysis, reflection and research. Analyze in writing how multiple texts examine similar themes or how multiple themes in one text contribute to a larger theme. Utilize evidence to support analysis, reflection and research. 	<ul style="list-style-type: none"> Draw evidence from informational texts to support analysis, reflection, and research about two objects interacting through electric or magnetic fields and the forces between objects and the changes in energy of the objects due to the interaction. Physics, Unit 8

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Collect empirical evidence from a variety of sources
- Integrate evidence in written communication

NJSLS-ELA Anchor Standard Speaking and Listening 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Integration with Constructing Explanations and Designing Solutions: A theory in science and a design in engineering is a rational explanatory account of how the world works in light of the evidence. Speaking and Listening Standard 4 stresses how the presentation of findings crucially relies on how the evidence is used to illuminate the line of reasoning embedded in the explanation offered.

Speaking and Listening 4 with Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> • Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.9-10.4. 	<ul style="list-style-type: none"> • Formulate a clear and concise perspective on a topic or issue. • Draw information from primary and secondary sources, and provide a conclusion. • Organize, develop, and produce a presentation in an appropriate style. • Present information clearly, concisely, and logically. • Use correct eye contact. • Adapt volume and tone to audience and purpose. 	<ul style="list-style-type: none"> • Present claims and findings about common ancestry and biological evolution, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Biology, Unit 8

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Speak with clear pronunciation. 	
<ul style="list-style-type: none"> • Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.11-12.4 	<ul style="list-style-type: none"> • Formulate a clear and distinct perspective on a topic or issue. • Draw information from primary and secondary sources, and provide a conclusion. • Differentiate and critique opposing viewpoints. • Organize, develop and produce a presentation in an appropriate style. • Present information clearly, concisely and logically. • Use correct eye contact. • Adapt volume and tone to audience and purpose. • Speak with clear pronunciation. 	<ul style="list-style-type: none"> • Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Chemistry, Unit 5

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly communicate findings to peers
- Use evidence to support findings
- Adapt speech to audience and purpose

Part 5: Engaging in Argument from Evidence

The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose. ([NRC Framework, 2012, p. 73](#)). Video summary of [Engaging in Argument from Evidence](#).

Engaging in Argument from Evidence in Grades 9 through 12:

- Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.
- Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments.
- Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions.
- Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence.
- Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence.
- Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and/or logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 6: Assess how point of view or purpose shapes the content and style of a text.

Integration with Engaging in Argument from Evidence: The central motivation of scientists and engineers is to put forth what they believe is the best explanation for a natural phenomenon or design solution, and to verify that representation through well-wrought arguments. Understanding the point of view of scientists and engineers and how that point of view shapes the content of the explanation is what Reading Standard 6 asks students to attune to.

Reading 6 and Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Determine 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. RST.9-10.6. 	<ul style="list-style-type: none"> Critically examine the author's overall purpose. Evaluate how an author uses various rhetorical strategies to advance that purpose. Analyze how the author addresses the question he/she wishes to define. 	<ul style="list-style-type: none"> Draw evidence from informational texts to support analysis, reflection, and research about how natural selection leads to adaptation of populations. Biology, Unit 7
<ul style="list-style-type: none"> 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. RST.11-12.6. 	<ul style="list-style-type: none"> Determine the author's overall purpose. Analyze how an author uses various rhetorical strategies to advance that purpose. Explain how and why the author has made those rhetorical decisions and how that contributes to the overall effectiveness of the text. 	<ul style="list-style-type: none"> Draw evidence from informational texts about the outermost electron states of atoms, trends in the periodic table, and patterns of chemical properties of elements to construct a rigorous explanation of the outcome of a simple chemical reaction. Chemistry, Unit 1

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Analyze the work of other experts in the field
- Understand the point of view of other scientists and technicians in their field of study
- Determine how a colleagues point of view shapes their understanding of a topic

NJSLS-ELA Anchor Standard Reading 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

Integration with Engaging in Argument from Evidence: Formulating the best explanation or solution to a problem or phenomenon stems from advancing an argument whose premises are rational and supported with evidence. Reading Standard 8 emphasizes evaluating the validity of arguments and whether the evidence offered backs up the claim logically.

Reading Standard 8 and Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none">• Determine if the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem. RST.9-10.8.	<ul style="list-style-type: none">• Evaluate whether the reasoning an author uses is logical or legitimate and if the evidence that is used is relevant to the claim or provides enough proof.• Use strong textual support to pinpoint any statements that are false and judge if any of the author’s reasoning is misleading.• Evaluate what a reliable source is and what makes one questionable	<ul style="list-style-type: none">• Assess the extent to which the claim that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem, is supported by reasoning and evidence. Biology, Unit 2

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Evaluate evidence and reasoning to solve a problem. 	
<ul style="list-style-type: none"> 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. RST.11-12.8. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis and conclusions in a text. Verify information presented in a text when possible. Validate or contest conclusions using other sources as support. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text relating that electromagnetic radiation can be described either by a wave model or a particle model and that for some situations one model is more useful than the other, verifying the data when possible and corroborating or challenging conclusions with other sources of information. Physics, Unit 7

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine if given information is valid
- Question hypotheses, data and conclusions
- Verify that information is correct
- Support analysis of hypotheses, data and conclusions with sources

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 9: Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Integration with Engaging in Argument from Evidence: Implicit in the practice of identifying the best explanation or design solution is comparing and contrasting competing proposals. Reading Standard 9 identifies the importance of comparing different sources in the process of creating a coherent understanding of a phenomenon, concept, or design solution.

Reading 9 and Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> 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. RST.9-10.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Determine the similarities and differences between information presented in different formats. Analyze points of comparison and contrast. Decipher contradictory information 	<ul style="list-style-type: none"> Compare different sources of information describing energy conversions to create a coherent understanding of energy flows into, out of, within, and between systems. Physics, Unit 4
<ul style="list-style-type: none"> Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. RST.11-12.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Blend information from a range of sources presented in different formats. 	<ul style="list-style-type: none"> Synthesize information about technological devices that use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy from a range of sources. (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Create a clear understanding of the content of a variety of sources. • Identify contradictory information and rectify contradictions. 	conflicting information when possible. Physics, Unit 7

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Analyze multiple sources to create data sets
- Use information from multiple sources to inform future work

NJSLS-ELA Anchor Standard Writing 1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Integration with Engaging in Argument from Evidence: Central to the process of engaging in scientific thought or engineering practices is the notion that what will emerge is backed up by rigorous argument. Writing Standard 1 places argumentation at the heart of the CCSS for science and technology subjects, stressing the importance of logical reasoning, relevant evidence, and credible sources.

Writing 1 and Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> • Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence. WHST.9-10.1. 	<ul style="list-style-type: none"> • Introduce precise claim(s). • Distinguish the claim(s) from alternate or opposing claims. • Create an organization that establishes clear relationships among 	<ul style="list-style-type: none"> • Write arguments, based on evidence, that inheritable genetic variations may result from new genetic combinations through meiosis, viable errors occurring during replication, and/or mutations caused by environmental factors. Biology, Unit 6

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<p>the claim(s), counterclaims, reasons, and evidence.</p> <ul style="list-style-type: none"> • Develop claim(s) and counterclaims using sound reasoning, supplying data and evidence for each. • Determine the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form. • Use transitions (e.g. words, phrases, 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 style and tone appropriate to the audience and purpose (e.g. formal and objective for academic writing). • Attend to the norms and conventions of the discipline in which they are writing. 	

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Provide a concluding paragraph or section that supports the argument presented. 	
<ul style="list-style-type: none"> • Write arguments focused on discipline-specific content. WHST.11-12.1. 	<ul style="list-style-type: none"> • Introduce precise, knowledgeable claim(s). • Establish the significance of the claim(s). • Distinguish the claim(s) from alternate or opposing claims. • Create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. • Develop claim(s) and counterclaims using sound reasoning. • Supply 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. • Anticipate the audience’s knowledge level, concerns, values and possible biases. 	<ul style="list-style-type: none"> • Write arguments focused on discipline-specific content related to the simultaneous co-evolution of Earth's systems and life on Earth. Capstone Science, Unit 3

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Use transitions (e.g. words, phrases, clauses) to link the major sections of the text, create cohesion. • Clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. • Establish and maintain a style and tone appropriate to the audience and purpose (e.g. formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing. • Provide a concluding paragraph or section that supports the argument presented. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly and logically debate a topic
- Use relevant sources to support their claim
- Prepare for and counter opposing viewpoints
- Evaluate resources for their validity and credibility

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Speaking and Listening 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.

Integration with Engaging in Argument from Evidence: Carrying out investigations in collaborative settings is crucial to learning in science class and engineering settings. Speaking and Listening Standard 1 speaks directly to the importance of exchanging theories and evidence cooperatively and collaboratively to carrying out investigations.

Speaking and Listening 1 with Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. SL.9-10.1. 	<ul style="list-style-type: none"> Prepare for discussions by reading or researching material under study. Refer to evidence on the topic, text or issue to pose salient questions. Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. Collaborate with peers to set rules for discussions. Propel conversations by posing and responding to questions. Actively incorporate others into the discussion. Clarify, verify or challenge ideas and conclusions. Respond thoughtfully to various perspectives 	<ul style="list-style-type: none"> Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Chemistry, Unit 2

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Summarize points of agreement and disagreement, and justify own views. Make new connections in light of the evidence and reasoning presented. 	
<ul style="list-style-type: none"> Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. SL.11-12.1. 	<ul style="list-style-type: none"> Prepare for discussions by reading or researching material under study. Refer to evidence on the topic, text or issue to pose salient questions. Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. Collaborate with peers to promote civil, democratic discussions. Propel conversations by posing and responding to questions that probe reasoning and evidence. Clarify, verify or challenge ideas and conclusions. Promote divergent and creative perspectives. Respond thoughtfully to diverse perspectives. Synthesize comments, claims, and evidence made on all sides of an issue. 	<ul style="list-style-type: none"> Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Capstone Science, Unit 1A

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Determine what additional information or research is required to deepen the investigation or complete the task. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Gain information and understanding through verbal discourse
- Pose questions of colleagues to gain insight or understanding

NJSLS-ELA Anchor Standard Speaking and Listening 3: Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric.

Integration with Engaging in Argument from Evidence: Evaluating the soundness of a speaker’s reasoning and evidence concerning scientific theories and concepts through a series of inquiries teaches students to be discriminating thinkers. Speaking and Listening Standard 3 directly asserts that students must be able to critique a point of view from the perspective of the evidence provided and reasoning advanced.

Speaking and Listening 3 with Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any false reasoning or distorted evidence. SL.9-10.3. 	<ul style="list-style-type: none"> Evaluate whether the reasoning a speaker uses is logical/legitimate. Identify false or misleading statements or evidence. Engage as an active listener and participant. 	<ul style="list-style-type: none"> Evaluate the validity of evidence and reasoning that support claims that complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem, verifying the data when

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Use text/source to show fallibility in speaker’s reasoning. 	<p>possible and corroborating or challenging conclusions with other sources of information. Biology, Unit 2</p>
<ul style="list-style-type: none"> Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. SL.11-12.3. 	<ul style="list-style-type: none"> Evaluate whether the reasoning a speaker uses is logical/legitimate and if the evidence is relevant. Identify false or misleading statements or evidence. Use evidence from sources/text to prove fallibility in speaker’s reasoning. Engage as an active listener and participant. Consider and assess the speaker’s argument, organization, diction and tone. 	<ul style="list-style-type: none"> Evaluate the hypotheses, data, analysis, and conclusions of competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost–benefit ratios, verifying the data when possible and corroborating or challenging conclusions with other design solutions. Capstone Science, Unit 1A

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Evaluate the validity of scientific theories or research
- Determine if interpretation of data is false or misleading
- Use the research of others during discourse with colleagues

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Speaking and Listening 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Integration with Engaging in Argument from Evidence: The practice of engaging in argument from evidence is a key ingredient in determining the best explanation for a natural phenomenon or the best solution to a design problem. Speaking and Listening Standard 4 stresses how the presentation of findings crucially relies on how the evidence is used to illuminate the line of reasoning embedded in the explanation offered.

Speaking and Listening 4 with Engaging in Argument from Evidence

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.9-10.4. 	<ul style="list-style-type: none"> Formulate a clear and concise perspective on a topic or issue. Draw information from primary and secondary sources, and provide a conclusion. Organize, develop, and produce a presentation in an appropriate style. Present information clearly, concisely, and logically. Use correct eye contact. Adapt volume and tone to audience and purpose. Speak with clear pronunciation. 	<ul style="list-style-type: none"> Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Chemistry, Unit 5
<ul style="list-style-type: none"> Present information, findings and supporting evidence clearly, concisely, 	<ul style="list-style-type: none"> Formulate a clear and distinct perspective on a topic or issue. 	<ul style="list-style-type: none"> Present claims and findings, emphasizing salient points in a

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
<p>and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.11-12.4</p>	<ul style="list-style-type: none"> • Draw information from primary and secondary sources, and provide a conclusion. • Differentiate and critique opposing viewpoints. • Organize, develop and produce a presentation in an appropriate style. • Present information clearly, concisely and logically. • Use correct eye contact. • Adapt volume and tone to audience and purpose. • Speak with clear pronunciation. 	<p>focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Chemistry, Unit 5</p>

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly communicate findings to peers
- Use evidence to support findings
- Adapt speech to audience and purpose

Part 6: Obtaining, Evaluating, and Communicating Information

Any education in science and engineering needs to develop students' ability to read and produce domain-specific text. As such, every science or engineering lesson is in part a language lesson, particularly reading and producing the genres of texts that are intrinsic to science and engineering ([NRC Framework, 2012, p. 76](#)). Video summary of [Obtaining, Evaluating, and Communicating Information](#).

Obtaining, Evaluating, and Communicating Information in Grades 9 through 12:

- Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem.
- Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
- Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.
- Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, and/or mathematically).

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

Integration with Obtaining, Evaluating and Communicating Information: Part of the power of a scientific theory or engineering design is its ability to be cogently explained. That ability to determine and clearly state or summarize a salient scientific concept or phenomena lies at the heart of **Reading Standard 2**.

Reading 2 and Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students ...	Examples
<ul style="list-style-type: none"> Determine the central ideas, themes, 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. RST.9-10.2. 	<ul style="list-style-type: none"> Evaluate the central idea. Analyze how details develop the central idea. Make inferences using implicit and explicit textual evidence. Use the text to draw conclusions about the central idea. Formulate an objective summary of the text. Determine how the central idea emerges and is refined or strengthened through key details. 	<ul style="list-style-type: none"> While analyzing scientific research related to feedbacks in the Earth system, students 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. Capstone Science, Unit 3
<ul style="list-style-type: none"> Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by 	<ul style="list-style-type: none"> Determine two or more central ideas in a text. Recognize supporting details for central ideas. 	<ul style="list-style-type: none"> Determine the central ideas or conclusions of a text about changes to Earth's surface changes and their effects on Earth systems; summarize complex concepts, processes, or

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students ...	Examples
<p>paraphrasing them in simpler but still accurate terms. RST.11-12.2.</p>	<ul style="list-style-type: none"> • Analyze central ideas as it develops over the course of the text. • Make inferences through the use of details regarding the thematic development. • Use the text to draw conclusions. • Examine how the interaction of central ideas create the overall meaning of the text. • Construct an objective summary of the text. 	<p>information presented in a text describing Earth's surface changes and their effects on Earth systems by paraphrasing them in simpler but still accurate terms. Physics, Unit 5</p>

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine the central idea of scientific text
- Support the explanation of the central idea with details
- Objectively summarize text, free of personal bias

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Anchor Standard Reading 7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Integrating with Obtaining, Evaluating and Communicating Information: A key practice within scientific and engineering communities is communicating about data through the use of tables, diagrams, graphs and models. Reading Standard 7 speaks directly to the importance of understanding information that has been gathered by investigators in visual formats that reveal deeper explanations and analyses.

Reading 7 and Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> 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. RST.9-10.7. 	<ul style="list-style-type: none"> Critically examine the information presented in both written and visual form. Create a visual form of information or data presented in written form. Interpret visual or mathematical information into written form. 	<ul style="list-style-type: none"> Translate information from the periodic table about the patterns of electrons in the outermost energy level of atoms into words that describe the relative properties of elements. Chemistry, Unit 1
<ul style="list-style-type: none"> 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. RST.11-12.7. 	<ul style="list-style-type: none"> Compare, contrast and assess how information from various sources is expressed in multiple mediums. Analyze how the information presented in each source expressed in different mediums affects the overall message. 	<ul style="list-style-type: none"> Integrate and evaluate multiple sources of information presented in diverse formats and media in order to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. Physics, Unit 1

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Use references to the different sources to answer a question or to solve a problem. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Determine the best representation for information
- Read a variety of charts and graphs
- Create charts and graphs from text
- Explain information presented in charts and graphs
- Determine the necessary information from visual representations
- Evaluate information in text

NJSL-ELA Anchor Standard Reading 9: Analyze and reflect on how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Integration with Obtaining, Evaluating and Communicating Information: The end goal of these scientific and engineering practices is to position scientists and engineers to be able to evaluate the merit and validity of claims, methods, and designs. Reading Standard 9 identifies the importance of synthesizing information from a range of sources to the process of creating a coherent understanding of a phenomenon or concept.

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

Reading 9 and Obtaining, Evaluating and Communicating Information

NJSL-ELA Indicators	Students to...	Examples
<ul style="list-style-type: none"> 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. RST.9-10.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Determine the similarities and differences between information presented in different formats. Analyze points of comparison and contrast. Decipher contradictory information. 	<ul style="list-style-type: none"> Compare different sources of information describing energy conversions to create a coherent understanding of energy flows into, out of, within, and between systems. Physics, Unit 4
<ul style="list-style-type: none"> Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. RST.11-12.9. 	<ul style="list-style-type: none"> Closely read and analyze information presented as text and in visual form, including student-led experiments. Blend information from a range of sources presented in different formats. Create a clear understanding of the content of a variety of sources. Identify contradictory information and rectify contradictions. 	<ul style="list-style-type: none"> Synthesize information about technological devices that use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy from a range of sources. (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. Physics, Unit 7

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Analyze multiple sources to create data sets
- Use information from multiple sources to inform future work

NJSLS-ELA Anchor Standard Reading 10: Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

Integrating with Obtaining, Evaluating and Communicating Information: 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. Reading Standard 10 asks students to read complex informational texts in these fields with independence and confidence.

Reading 10 and Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none">• By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. RST.9-10.10.	<ul style="list-style-type: none">• Closely read various forms of literature independently and fluently, including stories, dramas, and poems.• Demonstrate comprehension of various forms of literary text.• Make connections among ideas and between texts.• Consider a wider range of textual evidence.	<ul style="list-style-type: none">• Students read <u>The Periodic Kingdom: A Journey into the Land of Chemical Elements</u>. By P.W. Atkins, 1995, Basic Books in New York. The students use the book to create a conceptual model of the organization of the Periodic Table and principles for using it to predict behavior of elements and molecules. (NOTE: This title is provided as an example only. The NJDOE neither promotes nor endorses specific commercial products.)

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Become more sensitive to inconsistencies, ambiguities, and poor reasoning in texts. • Monitor comprehension. • Employ appropriate reading and note-taking strategies and/or ask for help in order to understand portions of a difficult text. 	
<ul style="list-style-type: none"> • By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently. RH.11-12.10. 	<ul style="list-style-type: none"> • Closely read various forms of literature and literary nonfiction independently, proficiently, and, fluently. • Demonstrate comprehension of various forms of literary text by showing a steadily growing ability to discern more and make fuller use of text. • Generate connections among ideas and between texts. • Consider and evaluate a wider range of textual evidence. • Become more sensitive to inconsistencies, ambiguities, and poor reasoning in texts. 	<ul style="list-style-type: none"> • Students read <u>Black Gold</u>. by Albert Marrin, Alfred A. Knopf. New York, NY, 2012. The book is used as the anchoring phenomena for a unit focusing on HS-ESS3-1, HS-ESS3-1, and HS-ESS3-1. <i>(NOTE: This title is provided as an example only. The NJDOE neither promotes nor endorses specific commercial products.)</i>

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Employ appropriate reading and note-taking strategies and/or ask for help in order to understand portions of a difficult text. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Read and comprehend complex scientific and technical text
- Employ strategies when having difficulty comprehending text

NJSL-ELA Anchor Standard Writing 2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Writing 2 with Obtaining, Evaluating and Communicating Information: The demand for precision in expression is an essential requirement of scientists and engineers, and using the multiple means available to them is a crucial part of that expectation. With a focus on clearly communicating complex ideas and information by critically choosing, arranging, and analyzing information—particularly through the use of visual means—Writing Standard 2 requires students to develop their claims with the end goal of explanation in mind.

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Writing 2 and Obtaining, Evaluating and Communicating Information

NJSL-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-10.2. 	<ul style="list-style-type: none"> Integrate multimedia when appropriate and effective. Use relevant and sufficient facts, definitions, details, and quotes. Use sources that are appropriate to task, audience, and purpose. Choose precise words and domain-specific vocabulary. Introduce a topic arranging ideas, concepts, and information to show interrelationships. Use transitions to link together the major sections of the text. Write a concluding paragraph or section that supports the information presented. Choose a formal style and objective tone. Incorporate facts, definitions, details, quotations and other information as needed. 	<ul style="list-style-type: none"> Use empirical evidence to write an explanation for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. Biology, Unit 3

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NJSL-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.11-12.2. 	<ul style="list-style-type: none"> Effectively select, organize and analyze content. Use sources that are appropriate to task, audience, and purpose. Use relevant and sufficient facts, definitions, details, and quotes. Examine and communicate complex ideas, concepts or information clearly and accurately. Introduce a topic by arranging ideas, concepts and information to show interrelationships. Choose a formal style and objective tone. Choose precise words, domain-specific vocabulary, and figurative language, such as similes, metaphors, and analogies. Incorporate analysis of textual evidence to further content. Provide multimedia when useful. Use transitions and syntax to link together the major sections of the text. 	<ul style="list-style-type: none"> Write informative texts about the ages of crustal rocks based on evidence of past and current movements of continental and oceanic crust, including the narration of historical events, scientific procedures/experiments, or technical processes. Capstone Science, Unit 2

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NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Write a concluding paragraph or section that supports the information presented. 	

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly explain information to a variety of audiences
- Use the research of others to support their theories and ideas
- Use multimedia to aid in explanation

NJSLS-ELA Anchor Standard Writing 8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

Integrating with Evaluating and Communicating Information: Collecting relevant data across a broad spectrum of sources in a systematic fashion is a key element of assessing the validity of claims, methods, and designs. Writing Standard 8 spells out the importance of gathering applicable information from multiple reliable sources so that information can be communicated accurately.

Writing 8 and Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Gather print and digital information. Assess credibility and accuracy of sources. 	<ul style="list-style-type: none"> Gather relevant information on the interaction of two objects through electric or magnetic fields from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of

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NJSL-ELA Indicators	Students...	Examples
<p>flow of ideas, avoiding plagiarism and following a standard format for citation. WHST.9-10.8.</p>	<ul style="list-style-type: none"> • Assess whether information from reliable and authoritative sources is relevant. • Utilize quotations within writing to further claims. • Paraphrase correctly. • Follow a standard format for citation. 	<p>the development of a model to illustrate the forces between objects and the changes in energy of the objects as they interact through electric or magnetic fields; integrate information into text describing the interaction of two objects through electric or magnetic fields selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. Physics, Unit 8</p>
<ul style="list-style-type: none"> • 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. WHST.11-12.8. 	<ul style="list-style-type: none"> • Gather grade-appropriate print and digital information. • Consider the sources in terms of task, audience and purpose. • Assess the validity of each source as it pertains to the specific task, purpose and audience. • Assess whether information from reliable and authoritative sources is relevant. • Utilize a variety of sources, not depending on one specific source. 	<ul style="list-style-type: none"> • Gather relevant information from multiple authoritative print and digital sources describing the effects that different frequencies of electromagnetic radiation have when absorbed by matter, 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

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NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Follow a standard format for citation (MLA, APA, etc.). 	format for citation. Capstone Science, Unit 6

Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Collect data from a variety of sources, both print and digital
- Determine if a particular source is relevant
- Determine if the information in a source is reliable and valid

NJSLS-ELA Anchor Standard Speaking and Listening 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Integrating with Obtaining, Evaluating and Communicating Information: Reasoning and argument require critical listening and collaboration skills in order to evaluate the merit and validity claims, methods, and designs. Speaking and Listening Standard 1 speaks directly to the importance of comparing and assessing competing ideas through extended discussions grounded in evidence.

Speaking and Listening 1 with Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' 	<ul style="list-style-type: none"> Prepare for discussions by reading or researching material under study Refer to evidence on the topic, text or issue to pose salient questions. 	<ul style="list-style-type: none"> Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSL-ELA Indicators	Students...	Examples
<p>ideas and expressing their own clearly and persuasively. SL.9-10.1.</p>	<ul style="list-style-type: none"> • Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. • Collaborate with peers to set rules for discussions. • Propel conversations by posing and responding to questions. • Actively incorporate others into the discussion. • Clarify, verify or challenge ideas and conclusions. • Respond thoughtfully to various perspectives. • Summarize points of agreement and disagreement, and justify own views. • Make new connections in light of the evidence and reasoning presented. 	<p>specific textual evidence. Chemistry, Unit 2</p>
<ul style="list-style-type: none"> • Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. SL.11-12.1. 	<ul style="list-style-type: none"> • Prepare for discussions by reading or researching material under study. • Refer to evidence on the topic, text or issue to pose salient questions. 	<ul style="list-style-type: none"> • Ask and refine questions to support uniform energy distribution among the components in a system when two components of different temperature are combined, using specific textual evidence. Capstone Science, Unit 1A

Integration of English language Arts and Science and Engineering Practices in Grades 9 through 12

NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Use evidence to stimulate a thoughtful, well-reasoned exchange of ideas. • Collaborate with peers to promote civil, democratic discussions. • Propel conversations by posing and responding to questions that probe reasoning and evidence. • Clarify, verify or challenge ideas and conclusions. • Promote divergent and creative perspectives. • Respond thoughtfully to diverse perspectives. • Synthesize comments, claims, and evidence made on all sides of an issue. • Determine what additional information or research is required to deepen the investigation or complete the task. 	

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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Gain information and understanding through verbal discourse
- Pose questions of colleagues to gain insight or understanding
- Use sources to support ideas or conclusion

NJSLS-ELA Anchor Standard Speaking and Listening 4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

Integrating with Obtaining, Evaluating and Communicating Information: Central to the professional activity of scientists and engineers alike is communicating their findings clearly and persuasively. Speaking and Listening Standard 4 stresses how the presentation of findings crucially relies on how the evidence is used to illuminate the line of reasoning embedded in the explanation offered.

Speaking and Listening 4 with Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none">• Present information, findings, and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.9-10.4.	<ul style="list-style-type: none">• Formulate a clear and concise perspective on a topic or issue.• Draw information from primary and secondary sources, and provide a conclusion.• Organize, develop, and produce a presentation in an appropriate style.• Present information clearly, concisely, and logically.	<ul style="list-style-type: none">• Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Chemistry, Unit 5

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NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Use correct eye contact. • Adapt volume and tone to audience and purpose. • Speak with clear pronunciation. 	
<ul style="list-style-type: none"> • Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. SL.11-12.4 	<ul style="list-style-type: none"> • Formulate a clear and distinct perspective on a topic or issue. • Draw information from primary and secondary sources, and provide a conclusion. • Differentiate and critique opposing viewpoints. • Organize, develop and produce a presentation in an appropriate style. • Present information clearly, concisely and logically. • Use correct eye contact. • Adapt volume and tone to audience and purpose. • Speak with clear pronunciation. 	<ul style="list-style-type: none"> • Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. Chemistry, Unit 5

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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Clearly communicate findings to peers
- Use evidence to support findings
- Adapt speech to audience and purpose

NJSLS-ELA Anchor Standard Speaking and Listening 5: Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Integrating with Obtaining, Evaluating and Communicating Information: Presenting data for the purposes of cross-comparison is essential for identifying the best design solution or scientific explanation. Speaking and Listening Standard 5 stresses the importance of visual displays of data within presentations in order to enhance understanding of the relevance of the evidence. That way others can make critical decisions regarding what is being claimed based on the data.

Speaking and Listening with Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> • Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest. SL.9-10.5. 	<ul style="list-style-type: none"> • Engage audience and enhance their understanding of findings, reasoning, and evidence by incorporating digital media such as textual, graphical, audio, visual, or interactive elements. 	<ul style="list-style-type: none"> • Make strategic use of digital media in presentations to enhance understanding of the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Biology, Unit 5
<ul style="list-style-type: none"> • Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, 	<ul style="list-style-type: none"> • Consider, determine and apply the most strategic use of digital media. • Engage audience and enhance their understanding of findings, reasoning, 	<ul style="list-style-type: none"> • Make strategic use of digital media in presentations to enhance understanding of the notion that energy is a quantitative property of a system and that the change in the

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reasoning, and evidence and to add interest. SL.11-12.5.	and evidence by incorporating digital media such as textual, graphical, audio, visual, or interactive elements.	energy of one component in a system can be calculated when the change in energy of the other component(s) and energy flows in and out of the system are known. Capstone Science, Unit 6
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Connection to Careers in Science and Technical Fields

Those in science and technical fields need to be able to...

- Present information in a clear, concise format
- Utilize diverse media formats to present findings and research

References

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