

Introduction

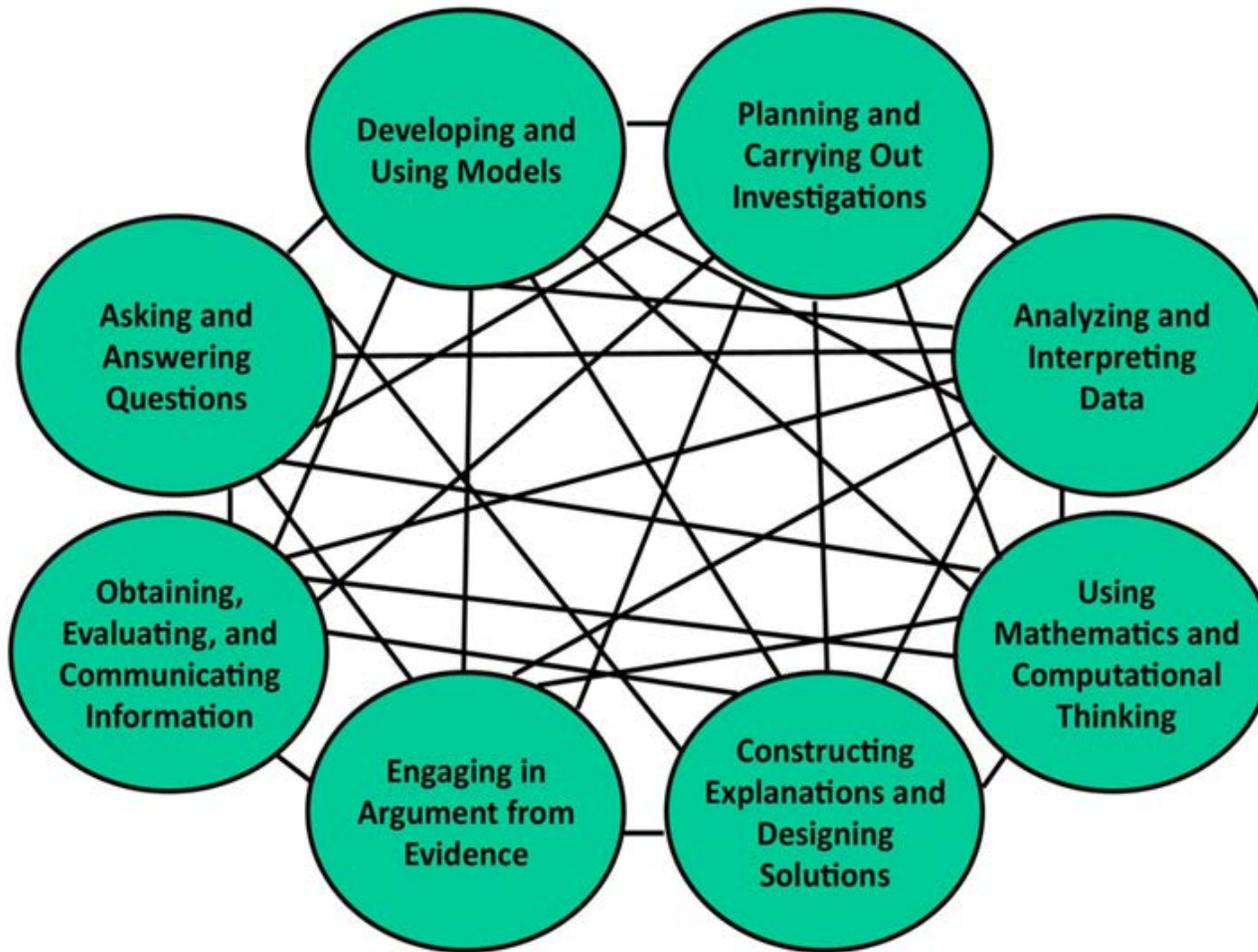
Developing literacy skills within specific content areas is an important life skill for student as they prepare to be college and career ready. The mutually supportive nature of the New Jersey Student Learning Standards for English Language Arts (NJSLS-ELA) and the New Jersey Student Learning Standards 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 Anchors and the Science and Engineering Practices in grades 6 through 8.

The Science and Engineering Practices are an essential component of the NJSLS-S. The practice are essential 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 or show competence in practices except in the context of specific core ideas (NRC Framework, 2012, p. 218). 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 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](#)). Video summarizing [Asking Questions and Defining Problems](#).

Asking Questions and Defining Problems in Grades 6 through 8:

- Ask questions
 - that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.
 - to identify and/or clarify evidence and/or the premise(s) of an argument.
 - to determine relationships between independent and dependent variables and relationships in models.
 - to clarify and/or refine a model, an explanation, or an engineering problem.
 - that require sufficient and appropriate empirical evidence to answer.
 - that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.
 - that challenge the premise(s) of an argument or the interpretation of a data set.
- Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

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"> Cite specific textual evidence to support analysis of science and technical texts. RST.6-8.1. 	<ul style="list-style-type: none"> Closely read the text Use strategies like questioning, determining importance, and looking for patterns to extract quality evidence to support a claim. Make personal connections, make connections to other text, and/or global connections when relevant. Gather evidence from the text to support inferences or explicit meaning. Paraphrase and directly quote evidence from text when responding to questions. 	<ul style="list-style-type: none"> Cite specific, empirical, textual evidence to support analysis of how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Grade 6, 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

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"> • Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.7. 	<ul style="list-style-type: none"> • Closely read text and graphic information. • Evaluate the impact different mediums have on central ideas presented in a text. • Evaluate how messages can most effectively be delivered to the intended audience. • Reflect on the effectiveness of different mediums in expressing information. • Glean information gained from both print and graphic sources. 	<ul style="list-style-type: none"> • Integrate quantitative or technical information expressed in words in a text about scale properties of objects in the solar system with a version of that information expressed visually in a flowchart, diagram, model, graph, or table. Grade 6, Unit 6

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"> • Distinguish among facts, reasoned judgment based on research findings and speculation in a text. RST.6-8.8. 	<ul style="list-style-type: none"> • Determine the difference between facts and reasonable interpretations of research findings in a text. • Determine when an author is speculating and not using facts or research as a basis of understanding. • Evaluate the soundness of the reasoning in a text. 	<ul style="list-style-type: none"> • Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning

NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> • Recognize when weak and/or irrelevant evidence is given in a text. • Recognize when misleading support is given. • Evaluate the quality and sufficiency of the evidence given as support. 	from claims that are not. Grade 6, 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

NJSL-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

NJSL-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. WHST.6-8.7. 	<ul style="list-style-type: none"> Explore inquiry topics through short research projects. Compose student-generated questions focused around science and technical topics. Research and synthesize information from several sources. Develop research questions. Compose follow-up research questions based on the initial search. 	<ul style="list-style-type: none"> Conduct research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. Grade 7, Unit 3

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 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly. SL.8.1. 	<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 probe and reflect on ideas under discussion. Pose questions that connect the ideas of several speakers. Respond to others’ questions and comments with relevant evidence, observations and ideas. Acknowledge new information expressed by others. Use evidence to support or refute views expressed in the discussion. 	<ul style="list-style-type: none"> Engage effectively in a range of collaborative discussions with diverse partners to discuss how natural selection leads to the predominance of certain traits in a population and the suppression of others. Discussions may be one-on-one, in groups, or teacher-led; in these discussions, students should build on others’ ideas while expressing their own clearly. Grade 8, Unit 2

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 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.

Speaking and Listening Anchor 3 and Asking Questions and Defining Problems

NJSLS-ELA Indicators	Students should be able to...	Example
<ul style="list-style-type: none"> • Delineate a speaker’s argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. SL.8.3. 	<ul style="list-style-type: none"> • Determine the speaker’s argument and claims. • Evaluate whether the speaker’s reasoning is rational and legitimate. • Evaluate whether there is enough evidence to support the claims. • Identify when extraneous information is presented. 	<ul style="list-style-type: none"> • Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning from claims that are not. Grade 6, Unit 1

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](#)). Video summarizing [Planning & Carrying Out Investigations](#).

Planning and Carrying Out Investigations:

- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
- Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.
- Evaluate the accuracy of various methods for collecting data.
- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.
- Collect data about the performance of a proposed object, tool, process or system under a range of conditions.

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 multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6-8.3. 	<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"> Follow precisely a multistep procedure when carrying out experiments to apply Newton’s third law when designing a solution to a problem involving the motion of two colliding objects, taking measurements, or performing technical tasks. Grade 6, Unit 4

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

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 inquiries.

Writing Anchor 7 with Planning and Carrying out Investigations

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. WHST.6-8.7. 	<ul style="list-style-type: none"> Create a research plan to answer a question. Explore inquiry topics through short research projects. Compose student-generated questions focused around science and technical topics. Research and synthesize information from several sources. Adapt and revise the research plan, if necessary. Compose follow-up research questions based on the initial search. 	<ul style="list-style-type: none"> Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading texts about the application of Newton's third law to the motion of two colliding objects. Conduct a short research project to answer a question about the application of Newton's third law when designing a solution to a problem involving the motion of two colliding objects, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. Grade 6, Unit 4

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

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 print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. WHST.6-8.8. 	<ul style="list-style-type: none"> • Use search terms effectively. • Draw evidence from multiple texts to support thesis. • Assess the credibility and accuracy of each source. • Select direct and indirect quotations that relate to the topic as evidence. • Follow standard format guidelines for citation. 	<ul style="list-style-type: none"> • Gather relevant information from multiple print and digital sources that provide information about the application of Newton's third law when designing a solution to a problem involving the motion of two colliding objects; assess the credibility of each source and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. Grade 6, Unit 4

	<ul style="list-style-type: none"> • Identify examples of plagiarism in writing. • Avoid plagiarism in writing. 	
--	---	--

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 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 with Planning and Carrying Out Investigations

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> • Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly. SL.8.1. 	<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 probe and reflect on ideas under discussion. • Follow rules for collegial discussions and decision-making. 	<ul style="list-style-type: none"> • Engage effectively in a range of collaborative discussions with diverse partners to discuss how natural selection leads to the predominance of certain traits in a population and the suppression of others. Discussions may be one-on-one, in groups, or teacher-led; in these discussions, students should

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Pose questions that connect the ideas of several speakers. • Respond to others' questions and comments with relevant evidence, observations and ideas. • Acknowledge new information expressed by others. • Use evidence to support or refute views expressed in the discussion. 	<p>build on others' ideas while expressing their own clearly. Grade 8, Unit 2</p>

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](#).

Elements of Analyzing and Interpreting Data in Grades 6 through 8:

- Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.
- Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.
- Distinguish between causal and correlational relationships in data.
- Analyze and interpret data to provide evidence for phenomena.
- Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible.
- Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials).
- Analyze and interpret data to determine similarities and differences in findings.
- Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.

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"> Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.7. 	<ul style="list-style-type: none"> Closely read text and graphic information. Evaluate the impact different mediums have on central ideas presented in a text. Evaluate how messages can most effectively be delivered to the intended audience. Reflect on the effectiveness of different mediums in expressing information. Glean information gained from both print and graphic sources. 	<ul style="list-style-type: none"> Integrate qualitative information (flowcharts, diagrams, models, graphs, or tables) about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually, or integrate technical information about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually. Grade 7, Unit 1

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 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 the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. RST.6-8.9. 	<ul style="list-style-type: none"> • Closely read and analyze information presented as text and in visual form. • Determine the similarities and differences between information presented in different formats. • Analyze points of comparison and contrast. 	<ul style="list-style-type: none"> • Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and

NJSLS-ELA Indicators	Students...	Example
		concentration of a substance. Grade 7, Unit 3

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 and Analyzing and Interpreting Data

NJSLS-ELA Indicators	Students...	Example
<ul style="list-style-type: none"> • Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. SL.8.2. 	<ul style="list-style-type: none"> • Determine the purpose for presenting information in different media and formats. • Interpret the presenter’s purpose in conveying the information using particular media and formats. • Analyze the impact that the use of particular media and formats has on the audience. 	<ul style="list-style-type: none"> • Integrate quantitative or technical information about the fossil record that is expressed in words into a version of that information expressed visually in the form of a flowchart, diagram, model, graph, or table. Grade 8, Unit 1

NJSL-ELA Indicators	Students...	Example
	<ul style="list-style-type: none"> Evaluate the effectiveness of the presenter’s media and format choices. 	

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

NJSL-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 with Standard 5 Analyzing and Interpreting Data

NJSL-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. SL.8.5. 	<ul style="list-style-type: none"> Incorporate multimedia and visual displays into presentations. Analyze the impact that these multimedia and visual displays will have on the reader. 	<ul style="list-style-type: none"> Include multimedia components and visual displays as part of an argument about competing design solutions based on jointly developed and agreed-upon design criteria to clarify information. Include multimedia components and

NJSL-ELA Indicators	Students...	Examples
		visual displays. The multimedia component and visual displays should clarify claims and findings and emphasize salient points in the presentation. Grade 6, Unit 3

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 6 through 8:

- Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.
- Construct an explanation using models or representations.
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) 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 construct, revise and/or use an explanation for real world phenomena, examples, or events.
- Apply scientific reasoning to show why the data or evidence is adequate.
- Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing for the explanation or conclusion

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 with Constructing Explanations and Designing Solutions

NJSLS-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Cite specific textual evidence to support analysis of science and technical texts. RST.6-8.1. 	<ul style="list-style-type: none"> Closely read the text. Use strategies like questioning, determining importance, and looking for patterns to extract quality evidence to support a claim. Make personal connections, make connections to other text, and/or global connections when relevant. Gather evidence from the text to support inferences or explicit meaning. Paraphrase and directly quote evidence from text when responding to questions. 	<ul style="list-style-type: none"> Cite specific textual evidence to support analysis of science and technical texts on the characteristic properties of pure substances. Attend to precise details of explanations or descriptions about the properties of substances before and after they undergo a chemical process. Grade 7, 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 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

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 or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. RST.6-8.2. 	<ul style="list-style-type: none"> • Provide a statement of a central idea of a text, based on textual evidence. • Analyze the development of the central idea over the course of the text. • Analyze how the central idea relates to important details and facts. • Summarize the text objectively, capturing the main ideas. 	<ul style="list-style-type: none"> • Determine the central ideas or conclusions of a text; provide an accurate summary of the text to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals, distinct from prior knowledge or opinions. Grade 8, Unit 7

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

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"> • Distinguish among facts, reasoned judgment based on research findings and speculation in a text. RST.6-8.8. 	<ul style="list-style-type: none"> • Determine the difference between facts and reasonable interpretations of research findings in a text. • Determine when an author is speculating and not using facts or research as a basis of understanding. • Evaluate the soundness of the reasoning in a text. • Recognize when weak and/or irrelevant evidence is given in a text. • Recognize when misleading support is given. • Evaluate the quality and sufficiency of the evidence given as support. 	<ul style="list-style-type: none"> • Distinguish among facts, reasoned judgment based on research findings, and speculation when reading text about maintaining biodiversity and ecosystem services. Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Grade 6, Unit 3

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.6-8.2. 	<ul style="list-style-type: none"> • Focus writing by thoroughly describing or explaining a topic. • Write an introduction that clearly outlines ideas to follow. • Organize ideas and information using text structures and text features. • Select facts, definitions, concrete details, quotations, or other information and examples. 	<ul style="list-style-type: none"> • Write informative/explanatory texts examining how the uneven distributions of Earth’s mineral, energy, and groundwater resources are the result of past and current geosciences processes. Convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. Grade 8, Unit 3

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Use transitional words and phrases. • Choose specific vocabulary and language. • Develop and use a consistent style, approach and form for the task. • Write a conclusion to close the ideas in the text. • Create language that is appropriate to one's audience and a formal tone. 	

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.

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 print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. WHST.6-8.8. 	<ul style="list-style-type: none"> Use search terms effectively. Draw evidence from multiple texts to support thesis. Assess the credibility and accuracy of each source. Select direct and indirect quotations that relate to the topic as evidence. Follow standard format guidelines for citation. Identify examples of plagiarism in writing. Avoid plagiarism in writing. 	<ul style="list-style-type: none"> Gather relevant information to inform the design, construction, and testing of a device that either minimizes or maximizes thermal energy transfer using multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. Grade 8, 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 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.6-8.9. 	<ul style="list-style-type: none"> • Identify evidence that supports claims. • Incorporate textual evidence into written pieces. • Logically connect evidence to claims in writing. • Analyze author’s use of style and structure. 	<ul style="list-style-type: none"> • Draw evidence from informational texts to support analysis, reflection, and research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance. Grade 7, Unit 3

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 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. SL.8.4. 	<ul style="list-style-type: none"> Formulate a clear perspective on a topic or issue. Draw information from primary and secondary sources. Organize, develop and produce a presentation in an appropriate. 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 about how natural selection leads to the predominance of certain traits in a population and the suppression of others. Claims must emphasize salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details. Students must use appropriate eye contact, adequate volume, and clear pronunciation. Grade 8, Unit 2

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 6 through 8:

- Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.
- Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.
- Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
- Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

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"> Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text. RST.6-8.6. 	<ul style="list-style-type: none"> Provide a statement of an author's point of view and author's purpose in a text. Identify points of bias in a text. Explain how the author acknowledges and responds to counterarguments. Analyze the impact of the author's purpose on the reader. Evaluate the effectiveness of the purpose. 	<ul style="list-style-type: none"> Draw evidence from informational texts to support an analysis of, reflection on, and research about anatomical similarities and differences among modern organisms and between modern and fossil organisms used to infer evolutionary relationships. Grade 8, Unit 1

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"> Distinguish among facts, reasoned judgment based on research findings and speculation in a text. RST.6-8.8. 	<ul style="list-style-type: none"> Determine the difference between facts and reasonable interpretations of research findings in a text. Determine when an author is speculating and not using facts or research as a basis of understanding. Evaluate the soundness of the reasoning in a text. Recognize when weak and/or irrelevant evidence is given in a text. Recognize when misleading support is given. Evaluate the quality and sufficiency of the evidence given as support. 	<ul style="list-style-type: none"> Distinguish among facts, reasoned judgment based on research findings, and speculation when reading text about maintaining biodiversity and ecosystem services. Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Grade 6, Unit 3

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 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 the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. RST.6-8.9. 	<ul style="list-style-type: none"> • Closely read and analyze information presented as text and in visual form. • Determine the similarities and differences between information presented in different formats. • Analyze points of comparison and contrast. 	<ul style="list-style-type: none"> • Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Grade 8, 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 focused on discipline-specific content. WHST.6-8.1. 	<ul style="list-style-type: none"> Introduce claim(s) about a topic or issue. Acknowledge and distinguish the claim(s) from alternate or opposing claims. Organize the reasons and evidence logically. Support claim(s) with logical reasoning and relevant, accurate data. Use evidence that demonstrates an understanding of the topic or text, using credible sources. Use words, phrases, and clauses to create cohesion. Clarify the relationships among claim(s), counterclaims, reasons, and evidence. 	<ul style="list-style-type: none"> Write an argument focused on how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Grade 6, Unit 1

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Establish and maintain a formal/academic style, approach, and form. • Provide a concluding statement or section that follows from and 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

NJSL-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

NJSL-ELA Indicators	Students...	Examples
<ul style="list-style-type: none"> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL.8.1. 	<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 probe and reflect on ideas under discussion. Follow rules for collegial discussions and decision-making. Pose questions that connect the ideas of several speakers. Respond to others' questions and comments with relevant evidence, observations and ideas. Acknowledge new information expressed by others. Use evidence to support or refute views expressed in the discussion. 	<ul style="list-style-type: none"> Engage in a range of collaborative discussions about the anatomical similarities and differences among modern organisms and between modern and fossil organisms used to infer evolutionary relationships. Discussions must provide opportunities for students to clearly express their own ideas and exchange ideas with others. The discussions may be one on one, in groups, or led by the teacher. Grade 8, Unit 1

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"> • Delineate a speaker’s argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced. SL.8.3. 	<ul style="list-style-type: none"> • Determine the speaker’s argument and claims. • Evaluate whether the speaker’s reasoning is rational and legitimate. • Evaluate whether there is enough evidence to support the claims. • Identify when extraneous information is presented. 	<ul style="list-style-type: none"> • Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning from claims that are not. Grade 6, Unit 2

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

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 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. SL.8.4. 	<ul style="list-style-type: none"> Formulate a clear perspective on a topic or issue. Draw information from primary and secondary sources. Organize, develop and produce a presentation in an appropriate. 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 to explain the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Emphasize the important points in a focused, coherent manner with relevant evidence, valid reasoning, and well-chosen details. During the presentation, students must use appropriate eye contact, adequate volume, and clear pronunciation. Grade 8, Unit 1

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 6 through 8:

- Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).
- Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings.
- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.
- Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts.
- Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.

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 or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. RST.6-8.2. 	<ul style="list-style-type: none"> Provide a statement of a central idea of a text, based on textual evidence. Analyze the development of the central idea over the course of the text. Analyze how the central idea relates to important details and facts. Summarize the text objectively, capturing the main ideas. 	<ul style="list-style-type: none"> Determine the central ideas or conclusions of a text; provide an accurate summary of the text to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals, distinct from prior knowledge or opinions. Grade 8, Unit 7

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

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"> Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). RST.6-8.7. 	<ul style="list-style-type: none"> Closely read text and graphic information. Evaluate the impact different mediums have on central ideas presented in a text. Evaluate how messages can most effectively be delivered to the intended audience. Reflect on the effectiveness of different mediums in expressing information. Glean information gained from both print and graphic sources. 	<ul style="list-style-type: none"> Integrate qualitative information (flowcharts, diagrams, models, graphs, or tables) about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually, or integrate technical information about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually. Grade 7, Unit 1

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 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.

Reading 9 and Obtaining, Evaluating and Communicating Information

NJSLS-ELA Indicators	Students to...	Examples
<ul style="list-style-type: none"> • Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. RST.6-8.9. 	<ul style="list-style-type: none"> • Closely read and analyze information presented as text and in visual form. • Determine the similarities and differences between information presented in different formats. • Analyze points of comparison and contrast. 	<ul style="list-style-type: none"> • Compare and contrast the information gained from experiments, simulations, or multimedia sources with that gained from reading text about devices that either minimize or maximize energy transfer. Grade 8, Unit 6

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 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. RST.6-8.10. 	<ul style="list-style-type: none"> • Determine difficulties in comprehending and making meaning. • Apply appropriate strategies in order to increase comprehension when encountering difficult text. • Encounter appropriately complex texts at each grade level in order to develop the mature language skills and the conceptual knowledge. • Encounter the text with minimal clarifications. • Discern more from and make fuller use of text. • Make an increasing number of connections among ideas and between texts. 	<ul style="list-style-type: none"> • Students read <u>The Bald Eagle Returns</u> by Dorothy Hinshaw Patent. 2000. Clarion Books. New York. as part of their 6th grade unit on Interdependent Relationships in Ecosystems.

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

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.

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.

Writing 2 and Obtaining, Evaluating and Communicating Information

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.6-8.2. 	<ul style="list-style-type: none"> • Focus writing by thoroughly describing or explaining a topic. • Write an introduction that clearly outlines ideas to follow. • Organize ideas and information using text structures and text features. • Select facts, definitions, concrete details, quotations, or other information and examples. • Use transitional words and phrases. 	<ul style="list-style-type: none"> • Write informative/explanatory texts examining how natural selection leads to the predominance of some traits in a population and the suppression of others. Convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. Grade 8, Unit 2

NJSL-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> • Choose specific vocabulary and language. • Develop and use a consistent style, approach and form for the task. • Write a conclusion to close the ideas in the text. • Create language that is appropriate to one's audience and a formal tone 	

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 print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. WHST.6-8.8. 	<ul style="list-style-type: none"> Use search terms effectively. Draw evidence from multiple texts to support thesis. Assess the credibility and accuracy of each source. Select direct and indirect quotations that relate to the topic as evidence. Follow standard format guidelines for citation. Identify examples of plagiarism in writing. Avoid plagiarism in writing. 	<ul style="list-style-type: none"> Gather relevant information from multiple print and digital sources about a method for monitoring and minimizing a human impact on the environment, assess the credibility of each source, and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. Grade 8, Unit 4

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"> • Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly. SL.8.1. 	<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 probe and reflect on ideas under discussion. • Follow rules for collegial discussions and decision-making. • Pose questions that connect the ideas of several speakers. • Respond to others’ questions and comments with relevant evidence, observations and ideas. • Acknowledge new information expressed by others. 	<ul style="list-style-type: none"> • Engage in a range of collaborative discussions about the anatomical similarities and differences among modern organisms and between modern and fossil organisms used to infer evolutionary relationships. Discussions must provide opportunities for students to clearly express their own ideas and exchange ideas with others. The discussions may be one on one, in groups, or led by the teacher. Grade 8, Unit 1

NJSLS-ELA Indicators	Students...	Examples
	<ul style="list-style-type: none"> Use evidence to support or refute views expressed in the discussion. 	

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 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, 	<ul style="list-style-type: none"> Formulate a clear perspective on a topic or issue. Draw information from primary and secondary sources. Organize, develop and produce a presentation in an appropriate. 	<ul style="list-style-type: none"> Present claims and findings to explain the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. Emphasize the important points in a focused, coherent manner with relevant

NJSL-ELA Indicators	Students...	Examples
adequate volume, and clear pronunciation. SL.8.4.	<ul style="list-style-type: none"> • Present information clearly, concisely, and logically. • Use correct eye contact. • Adapt volume and tone to audience and purpose. • Speak with clear pronunciation. 	evidence, valid reasoning, and well-chosen details. During the presentation, students must use appropriate eye contact, adequate volume, and clear pronunciation. Grade 8, Unit 1

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"> Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. SL.8.5. 	<ul style="list-style-type: none"> Incorporate multimedia and visual displays into presentations. Analyze the impact that these multimedia and visual displays will have on the reader. 	<ul style="list-style-type: none"> Include multimedia components and visual displays as part of an argument about competing design solutions based on jointly developed and agreed-upon design criteria to clarify information. Include multimedia components and visual displays. The multimedia component and visual displays should clarify claims and findings and emphasize salient points in the presentation. Grade 6, Unit 3

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

National Governors Association Center for Best Practices and Council of Chief State School Officers. 2010. *The Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*. National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C.

National Research Council. 2012. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.