

Template and Teaching Tasks for Science
 Designed by the Charles A. Dana Center at
 The University of Texas at Austin

Inspired and informed by the work of the Literacy Design Collaborative, the Dana Center designed these template tasks based on the practices of science and engineering and the cross-cutting concepts identified in *A Framework for K–12 Science Education* and aligned with the Next Generation Science Standards performance expectations. When filled in, these templates become teaching tasks that create opportunities for teaching literacy skills in science coursework. Template tasks for each practice and crosscutting concept are shown, along with sample teaching tasks that illustrate how to use each template task in designing teaching tasks.

Integration of Literacy Through Science and Engineering Practices

Asking Questions and Defining Problems		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 1: After reading scientific text about/investigating ____ (content), ask questions in writing to identify and clarify evidence of/determine relationships between ____ (content).	After investigating complex patterns of the movement of water in the atmosphere, ask questions in writing to identify and clarify evidence of the factors that have caused the rise in global temperatures over the past century. (MS-ESS3.5)
High School	Task 2: After reading scientific text/examining data/making observations about ____ (content), ask questions (orally or in writing)/evaluate ____ (content) by constructing ____ (product).	After reading scientific text about computer memory, evaluate questions about the advantages of digital transmission and storage by constructing a table based on textual evidence comparing advantages and disadvantages. (HS-PS4.2)
Developing and Using Models		
<i>Grade Band</i>	<i>Template</i>	<i>Teaching Task</i>
Middle School	Task 3: After reading scientific text ____ (content), develop/use a labeled model to predict and/or describe ____ (content).	After reading scientific text about the states of matter, develop a labeled model to describe particle motion in solids, liquids, and gases. (MS-PS1.4)
High School	Task 4: After reading scientific text/examining/investigating ____ (content), develop/revise/evaluate a model in order to determine merits and limitations/ascertain reliability/ illustrate or predict relationships or phenomena/test a process or system(s)/support explanations/solve problems ____ (content).	After reading scientific text about nuclear fusion, develop a labeled model based on evidence to illustrate the role of nuclear fusion in the sun’s core to release energy that eventually reaches the Earth in the form of radiation. (HS-ESS1-1)

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Planning and Carrying Out Investigations		
<i>Grade Band</i>	<i>Template</i>	<i>Teaching Task</i>
Middle School	Task 5: After conducting an investigation of ____ (content), produce ____ (product), to serve as the basis for evidence of ____ (content).	After conducting an investigation of fields between objects that are not in contact using magnets and iron filings, produce data in a table to serve as the bases for evidence that fields exist between objects and exert forces on each other even though the objects are not in contact. (MS-PS2.5)
High School	Task 6: After conducting an investigation of ____ (content), produce ____ (product) to support explanations of ____ (content).	After conducting an investigation of electromagnets, produce evidence in a data table to support explanations of how an electrical current can produce a magnetic field. (HS-PS2-5)
Analyzing and Interpreting Data		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 7: After examining/investigating ____ (content), analyze and interpret data to determine/provide ____ (product) detailing/describing/supporting ____ (content).	After examining maps showing fossils, rock types, continental shapes and seafloor structures, analyze and interpret data to provide a written description detailing evidence of past plate motion. (MS-ESS2.3)
High School	Task 8: After reading scientific text about/investigating ____ (content), construct ____ (product) to support claims about/determine an optimal design solution of ____ (content).	After investigating a moving object being pulled by a constant force, construct a data table to support claims about the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration (Newton's 2nd Law). (HS-PS2-1)
Using Mathematics and Computational Thinking		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 9: After reading scientific text about/examining data showing ____ (content), use mathematical representations in the form of ____ (product), to support scientific conclusions/explanations about ____ (content).	After reading scientific text about changes in populations over time, use mathematical representations in the form of a data table to support explanations about how natural selection may lead to increases and decreases of specific traits in populations over time. (MS-LS4.6)

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High School	Task 10: After reading scientific text about/examining data showing ____ (content), use mathematical representations in the form of ____ (product), to support claims about ____ (content).	After reading scientific text about the cycling of matter and flow of energy among organisms in an ecosystem, use a mathematical representation in the form of a biomass pyramid, to support claims about proportional amount of matter and energy that is transferred between trophic levels. (HS-LS2-4)
Constructing Explanations and Designing Solutions		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 11: After reading/investigating ____ (content), write a scientific explanation for ____ (content), based on valid and reliable evidence 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.	After reading about the carbon-oxygen cycle, write a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms, based on valid and reliable evidence 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. (MS-LS1.6)
	Task 12: After examining evidence of ____ (content), apply scientific principles and provide a written description for the design of ____ (content).	After examining evidence of human environmental impacts, apply scientific principles to a written description for the design of a method of monitoring and minimizing water waste by humans. (MS-ESS3-3)
High School	Task 11: After reading/investigating ____ (content), write a scientific explanation for ____ (content), based on valid and reliable evidence 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.	After investigating biotic and abiotic differences in ecosystems, construct an explanation for how natural selection leads to adaptation of populations, based on valid and reliable evidence 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. (HS-LS4-4)
	Task 12: After reading scientific text about ____ (content), use evidence to provide a written description for/ evaluate/refine the design of ____ (content).	After reading scientific text about trash production by humans, use evidence to evaluate the design of local recycling efforts. (HS-ESS3-4)

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Engaging in Argument from Evidence		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 13: After reading/investigating/examining evidence showing ____ (content), construct and present ____ (product) supported by empirical evidence and scientific reasoning to support/refute ____ (content).	After reading scientific text describing the relationship between mass and gravitational force, construct and present an oral argument supported by empirical evidence and scientific reasoning to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (MS-PS2.4)
High School	Task 14: After reading scientific text about ____ (content), evaluate the claims, evidence, and reasoning for ____ (content), by citing textual evidence in a ____ (product).	After reading scientific text about electromagnetic radiation, evaluate the claims, evidence, and reasoning for the wave model or particle model, by citing textual evidence in a comparative table. (HS-PS4-3)
Obtaining, Evaluating and Communicating Information		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 15: After researching ____ (content), construct a ____ (product) that communicates information about ____ (content).	After researching scientific text describing relationships among organisms (such as competition, predation or mutually beneficial relationships), construct a written explanation that communicates information about patterns of interactions among organisms across multiple ecosystems. (MS-LS2.2)
High School	Task 15: After researching ____ (content), construct a ____ (product) that communicates information about ____ (content).	After researching similarities in DNA sequences in different organisms, construct a written explanation that communicates information about common ancestry. (HS-LS4-1)

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Integration of Literacy Through Crosscutting Concepts

Patterns		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 1: After reading scientific text about/examining data showing ____ (content), construct ____ (product), to identify patterns ____ (content).	After reading scientific text about wave characteristics, construct a graph to identify patterns in the relationship between the amplitude of a wave and the energy of a wave. (MS-PS4.1) After reading scientific text about wave characteristics, construct a chart to identify patterns in the ratio (gr.6)/proportional relationship (gr. 7) between the amplitude of a wave and the energy of a wave. (MS-PS4.1)
High School	Task 2: After examining patterns in data showing ____ (content), provide written evidence in the form of ____ (product) for explanations of ____ (content).	After examining patterns in data showing shifts in numerical distribution of traits, provide written evidence in the form of a graph for the explanation of the increase in advantageous heritable traits. (HS-LS4-3)
Cause and Effect		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 3: After reading scientific text about/examining data showing ____ (content), create ____ (product), to describe the cause and effect relationship between ____ (content).	After examining data showing rainfall and plant growth, create a graph to describe the cause and effect relationship between environmental factors and the growth of organisms. (MS-LS1.5)
High School	Task 4: After examining/evaluating evidence of ____ (content), make a claim about ____ (content).	After evaluating evidence of the effects of environmental changes, make a claim about deforestation and the number of individuals of species. (HS-LS4-5)

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Scale, Proportion, and Quantity		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 5: After reading scientific text about/examining data showing ____ (content), create a large/small scale ____ (product), to show ____ (content).	After reading scientific text about simple molecules, create a large-scale model to show their atomic composition. (MS-PS1.1)
High School	Task 6: After examining scientific data showing ____ (content), explain/predict the effect of ____ (content) using ____ (product).	After examining scientific data showing environmental factors and the frequency of traits in a population, predict the effect of changing environmental factors on a trait using Punnett squares. (HS-LS4-3)
Systems and System Models		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 7: After reading scientific text about/examining data showing ____ (content), use a ____ (product), to represent ____ (content) system(s) and its/their interactions.	After reading scientific text about gravitational forces, use a model to represent the Earth-sun system and its interactions. (MS-PS2.4)
High School	Task 8: After investigating ____ (content) system, use a ____ (product) to support a claim about ____ (content).	<p>After investigating net force in a system, use a graph to support a claim about the conservation of total momentum of a system of two bodies moving in one dimension. (HS-PS2-2)</p> <p>After investigating the transfer of thermal energy in a closed system, use a chart to support a claim about energy distribution among the components in the system. (HS-PS3-4)</p>

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Energy and Matter: Flows, Cycles, and Conservation		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 9: After reading scientific text about/examining data showing ____ (content), construct a ____ (product) to represent the flow of energy through a/between ____ (content) system(s).	<p>After examining data showing temperature change over time of boiling water in an open Styrofoam cup, construct a graph to represent the flow of energy between the cup and surrounding systems. (MS-PS3.3)</p> <p>After reading scientific text about interactions of producers, consumers and decomposers, construct a diagram in the form of a food web to represent the flow of energy between living systems. (MS-LS2.3)</p>
High School	Task 10: After reading scientific text/examining data showing about ____ (content), construct an explanation for ____ (content) in terms of energy flow within/between objects/fields/systems.	After reading examining data showing evidence of the red shift of light from galaxies, construct an explanation for the expanding nature of the universe in terms of energy flow between systems. (HS-ESS1-2)
Structure and Function		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	Task 11: After reading scientific text about/examining ____ (content), provide evidence in the form of ____ (product) to show the connection between the properties of ____ (content), and ____ (content).	<p>After examining the bulk scale and atomic scale properties of water, provide evidence in the form of a written description to show the connection between properties of water and its effects on Earth materials. (HS-ESS2-5)</p> <p>After reading scientific text about protein synthesis, provide evidence in the form of a diagram to show the connection between the properties of DNA and the structure of proteins. (HS-LS1-1)</p>

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High School	<p>Task 12: After reading scientific text about/examining data showing ____ (content), construct ____ (product) to represent/ explain how the structure of ____ (content) reveals the function of ____ (content).</p>	<p>After reading scientific text about protein synthesis, construct a written explanation based on evidence to represent how the structure of proteins reveals the function of DNA. (HS-LS1-1)</p> <p>After reading scientific text about metallic bonding, construct an oral response to explain how the structure of metals reveals the function of electrically conductive materials. (HS-PS2.6) *</p>
Stability and Change		
<i>Grade Band</i>	<i>Template Task</i>	<i>Teaching Task</i>
Middle School	<p>Task 13: After reading scientific text about/examining data showing ____ (content), construct ____ (product) to represent ____ (content) remain stable/change in terms of ____ (content), over time.</p>	<p>After reading scientific text about the rock cycle, construct a diagram to represent the how cycling of Earth's materials and the energy that drives this process remains stable in terms of melting, crystallization, weathering, deformation, and sedimentation over time. (MS-ESS2-1)</p> <p>After examining data showing the effectiveness of design solutions for water purification, construct a comparative table to represent how they affect biodiversity in terms of economic and social considerations over time. (MS-LS2-5)</p>
High School	<p>Task 13: After reading scientific text about/examining data showing ____ (content), construct ____ (product) to represent ____ (content) remain stable/change in terms of ____ (content), over time.</p>	<p>After reading scientific text about seasonal flooding, construct a written explanation to represent how ecosystems remain stable in terms of numbers and types of organisms over time. (HS-LS2-6)</p> <p>After reading scientific text about volcanic eruptions, construct a written explanation to represent how ecosystems change, in terms of numbers and types of organisms, over time. (HS-LS2-6)</p> <p>After examining data about how photosynthetic life altered the atmosphere through the production of oxygen, construct a written argument based on evidence to represent how life on Earth changed, in terms of types of organisms, over time. (HS-LS2-6)</p>

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The following teaching tasks were designed from template tasks appearing in LDC Collection 2. The prompts engage students in writing in response to reading a variety of print and visual texts. Written products are multiparagraph compositions, including response papers, reports, and memos.

Informational or Explanatory Task 11 (Definition)

How does the structure of DNA determine the structure of proteins, which carry out the essential function of life through systems of specialized cells? After researching informational texts on protein synthesis, write a report in which you define the role of proteins in living organisms and explain how a specific gene on DNA encodes each protein. Support your discussion with evidence from your research. (HS-LS1-1)

Informational or Explanatory Task 13 (Description)

How do natural resources undergo chemical processes to become synthetic materials? After researching informational texts on the creation of medicines, write a report in which you describe the use of natural substances (plant, fungus or bacterium) in the creation of pharmaceuticals. Support your discussion with evidence from your research. (MS-PS1-3)

Informational or Explanatory Task 17 (Procedural-Sequential)

How is the motion of an object affected by its mass and the forces acting on it? After researching informational texts on balanced and unbalanced forces in a system, developing a hypothesis, and conducting an experiment examining qualitative comparisons of forces, mass, and changes in motion, write a laboratory report in which you explain your procedures and results and confirm or reject your hypothesis. (MS-PS2-2)

Informational or Explanatory Task 18 (Synthesis)

How is the body a system of interacting sub-systems composed of groups of cells? After researching informational texts on body systems and their functions, write a report in which you explain the organization and interactions of organ systems within the body. Support your discussion with evidence from your research. (MS-LS1-3)

Informational or Explanatory Task 20 (Analysis)

How can the numerical distribution of advantageous traits in populations be explained? After researching informational texts on natural selection, write a report in which you analyze the shifts in the numerical distribution of traits in a population, providing evidence to clarify your analysis. (HS-LS4-3)

Informational or Explanatory Task 24 (Cause-Effect)

How do increases in human population and per-capita consumption of natural resources impact Earth's systems? After researching informational texts on human populations and the rates of consumption of fresh water, write a report in which you examine the causes of fresh water scarcity and explain the effects on Earth's systems. Support your discussion with evidence from your research. (MS-ESS3-4)