ONREP

Oregon Natural Resources Education Program
~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

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Oregon Natural Resources Education Program

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Oregon State Standards, CCSS, and NGSS

English Language Arts & Literacy (CCSS)

Kindergarten

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

K.RL.1 With prompting and support, ask and answer questions about key details in a text.

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

K.RL.2 With prompting and support, retell familiar stories, including key details.

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

K.RL.3 With prompting and support, identify characters, settings, and major events in a story.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

K.RL.4 Ask and answer questions about unknown words in a text.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

K.RL.5 Recognize common types of texts (e.g., storybooks, poems).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

K.RL.6 With prompting and support, name the author and illustrator of a story and define the role of each in telling the story.

Integration of Knowledge and Ideas

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

K.RL.7 With prompting and support, describe the relationship between illustrations and the story in which they appear (e.g., what moment in a story an illustration depicts).

Anchor Standard 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.

K.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

K.RL.9 With prompting and support, compare and contrast the adventures and experiences of characters in familiar stories.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

K.RL.10 Actively engage in group reading activities with purpose and understanding.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

K.RI.1 With prompting and support, ask and answer questions about key details in a text.

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

K.RI.1 With prompting and support, identify the main topic and retell key details of a text.

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

K.RI.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

K.RI.4 With prompting and support, ask and answer questions about unknown words in a text.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

K.RI.5 Identify the front cover, back cover, and title page of a book.

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

K.RI.6 Name the author and illustrator of a text and define the role of each in presenting the ideas or information in a text.

Integration of Knowledge and Ideas

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

K.RI.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).

Anchor Standard 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.

K.RI.8 With prompting and support, identify the reasons an author gives to support points in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

K.RI.9 With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

K.RI.10 Actively engage in group reading activities with purpose and understanding.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

K.RF.1 Demonstrate understanding of the organization and basic features of print.

a. Follow words from left to right, top to bottom, and page by page.

b. Recognize that spoken words are represented in written language by specific sequences of letters.

c. Understand that words are separated by spaces in print.

d. Recognize and name all upper- and lowercase letters of the alphabet.

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

K.RF.2 Demonstrate understanding of spoken words, syllables, and sounds (phonemes).

a. Recognize and produce rhyming words.

b. Count, pronounce, blend, and segment syllables in spoken words.

c. Blend and segment onsets and rimes of single-syllable spoken words.

d. Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in three-phoneme (consonant-vowel-consonant, or CVC) words.* (This does not include CVCs ending with /l/, /r/, or /x/.)

e. Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words.

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

K.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary sound or many of the most frequent sounds for each consonant.

b. Associate the long and short sounds with common spellings (graphemes) for the five major vowels.

c. Read common high-frequency words by sight (e.g., the, of, to, you, she, my, is, are, do, does).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

d. Distinguish between similarly spelled words by identifying the sounds of the letters that differ.

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

K.RF.4 Read emergent-reader texts with purpose and understanding.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

K.W.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., My favorite book is . . .).

Anchor Standard 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.

K.W.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

K.W.3 Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

K.W.4 (Begins in grade 3)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

K.W.5 With guidance and support from adults, respond to questions and suggestions from peers and add details to strengthen writing as needed.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

K.W.6 With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

K.W.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).

Anchor Standard 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.

K.W.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

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

K.W.9 (Begins in grade 4)

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

K.W.10 (Begins in grade 3)

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

K.SL.1 Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.

a. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).

b. Continue a conversation through multiple exchanges.

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

K.SL.2 Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

K.SL.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

Presentation of Knowledge and Ideas

Anchor Standard 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.

K.SL.4 Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.

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

K.SL.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

K.SL.6 Speak audibly and express thoughts, feelings, and ideas clearly.

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

K.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Print many upper- and lowercase letters.

b. Use frequently occurring nouns and verbs.

c. Form regular plural nouns orally by adding /s/ or /es/ (e.g., dog, dogs; wish, wishes).

d. Understand and use question words (interrogatives) (e.g., who, what, where, when, why, how).

e. Use the most frequently occurring prepositions (e.g., to, from, in, out, on, off, for, of, by, with).

f. Produce and expand complete sentences in shared language activities.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

K.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Capitalize the first word in a sentence and the pronoun I.

b. Recognize and name end punctuation.

c. Write a letter or letters for most consonant and short-vowel sounds (phonemes).

d. Spell simple words phonetically, drawing on knowledge of sound-letter relationships.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

K.L.3 (Begins in grade 2)

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

K.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on kindergarten reading and content.

a. Identify new meanings for familiar words and apply them accurately (e.g., knowing duck is a bird and learning the verb to duck).

b. Use the most frequently occurring inflections and affixes (e.g., -ed, -s, re-, un-, pre-, -ful, -less) as a clue to the meaning of an unknown word.

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

K.L.5 With guidance and support from adults, explore word relationships and nuances in word meanings.

a. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent.

b. Demonstrate understanding of frequently occurring verbs and adjectives by relating them to their opposites (antonyms).

c. Identify real-life connections between words and their use (e.g., note places at school that are colorful).

d. Distinguish shades of meaning among verbs describing the same general action (e.g., walk, march, strut, prance) by acting out the meanings.

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

K.L.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

First Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

1.RL.1 Ask and answer questions about key details in a text.

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

1.RL.2 Retell stories, including key details, and demonstrate understanding of their central message or lesson.

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

1.RL.3 Describe characters, settings, and major events in a story, using key details.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

1.RL.4 Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

1.RL.5 Explain major differences between books that tell stories and books that give information, drawing on a wide reading of a range of text types.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

1.RL.6 Identify who is telling the story at various points in a text.

Integration of Knowledge and Ideas

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

1.RL.7 Use illustrations and details in a story to describe its characters, setting, or events.

Anchor Standard 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.

1.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

1.RL.9 Compare and contrast the adventures and experiences of characters in stories.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

1.RL.10 With prompting and support, read prose and poetry of appropriate complexity for grade 1.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

1.RI.1 Ask and answer questions about key details in a text.

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

1.RI.2 Identify the main topic and retell key details of a text.

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

1.RI.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

1.RI.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

1.RI.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.

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

1.RI.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.

Integration of Knowledge and Ideas

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

1.RI.7 Use the illustrations and details in a text to describe its key ideas.

Anchor Standard 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.

1.RI.8 Identify the reasons an author gives to support points in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

1.RI.9 Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

1.RI.10 With prompting and support, read informational texts appropriately complex for grade 1.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

1.RF.1 Demonstrate understanding of the organization and basic features of print.

a. Recognize the distinguishing features of a sentence (e.g., first word, capitalization, ending punctuation).

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

1.RF.2 Demonstrate understanding of spoken words, syllables, and sounds (phonemes).

a. Distinguish long from short vowel sounds in spoken single-syllable words.

b. Orally produce single-syllable words by blending sounds (phonemes), including consonant blends.

c. Isolate and pronounce initial, medial vowel, and final sounds (phonemes) in spoken single-syllable words.

d. Segment spoken single-syllable words into their complete sequence of individual sounds (phonemes).

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

1.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Know the spelling-sound correspondences for common consonant digraphs.

b. Decode regularly spelled one-syllable words.

c. Know final -e and common vowel team conventions for representing long vowel sounds.

d. Use knowledge that every syllable must have a vowel sound to determine the number of syllables in a printed word.

e. Decode two-syllable words following basic patterns by breaking the words into syllables.

f. Read words with inflectional endings.

g. Recognize and read grade-appropriate irregularly spelled words.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

1.RF.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.

b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

1.W.1 Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.

Anchor Standard 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.

1.W.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

1.W.3 Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

1.W.4 (Begins in grade 3)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

1.W.5 With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

1.W.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

1.W.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions).

Anchor Standard 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.

1.W.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

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

1.W.9 (Begins in grade 4)

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

1.W.10 (Begins in grade 3)

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

1.SL.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).

b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges.

c. Ask questions to clear up any confusion about the topics and texts under discussion.

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

1.SL.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

1.SL.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.

Presentation of Knowledge and Ideas

Anchor Standard 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.

1.SL.4 Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.

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

1.SL.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

1.SL.6 Produce complete sentences when appropriate to task and situation. (See grade 1 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

1.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

a. Print many upper- and lowercase letters.

b. Use common, proper, and possessive nouns.

c. Use singular and plural nouns with matching verbs in basic sentences (e.g., He hops; We hop).

d. Use personal, possessive, and indefinite pronouns (e.g., I, me, my; they, them, their; anyone, everything).

e. Use verbs to convey a sense of past, present, and future (e.g., Yesterday I walked home; Today I walk home; Tomorrow I will walk home).

f. Use frequently occurring adjectives.

g. Use frequently occurring conjunctions (e.g., and, but, or, so, because).

h. Use determiners (e.g., articles, demonstratives).

i. Use frequently occurring prepositions (e.g., during, beyond, toward).

j. Produce and expand complete simple and compound declarative, interrogative, imperative, and exclamatory sentences in response to prompts.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

1.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Capitalize dates and names of people.

b. Use end punctuation for sentences.

c. Use commas in dates and to separate single words in a series.

d. Use conventional spelling for words with common spelling patterns and for frequently occurring irregular words.

e. Spell untaught words phonetically, drawing on phonemic awareness and spelling conventions.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

1.L.3 (Begins in grade 2)

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

1.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 1 reading and content, choosing flexibly from an array of strategies.

a. Use sentence-level context as a clue to the meaning of a word or phrase.

b. Use frequently occurring affixes as a clue to the meaning of a word.

c. Identify frequently occurring root words (e.g., look) and their inflectional forms (e.g., looks, looked, looking).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

1.L.5 With guidance and support from adults, demonstrate understanding of word relationships and nuances in word meanings.

a. Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the categories represent.

b. Define words by category and by one or more key attributes (e.g., a duck is a bird that swims; a tiger is a large cat with stripes).

c. Identify real-life connections between words and their use (e.g., note places at home that are cozy).

d. Distinguish shades of meaning among verbs differing in manner (e.g., look, peek, glance, stare, glare, scowl) and adjectives differing in intensity (e.g., large, gigantic) by defining or choosing them or by acting out the meanings.

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

1.L.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., because).

Second Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

2.RL.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

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

2.RL.2 Recount stories, including fables and folktales from diverse cultures, and determine their central message, lesson, or moral.

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

2.RL.3 Describe how characters in a story respond to major events and challenges.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

2.RL.4 Describe how words and phrases (e.g., regular beats, alliteration, rhymes, repeated lines) supply rhythm and meaning in a story, poem, or song.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

2.RL.5 Describe the overall structure of a story, including describing how the beginning introduces the story and the ending concludes the action.

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

2.RL.6 Acknowledge differences in the points of view of characters, including by speaking in a different voice for each character when reading dialogue aloud.

Integration of Knowledge and Ideas

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

2.RL.7 Use information gained from the illustrations and words in a print or digital text to demonstrate understanding of its characters, setting, or plot.

Anchor Standard 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.

2.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

2.RL.9 Compare and contrast two or more versions of the same story (e.g., Cinderella stories) by different authors or from different cultures.

Range of Reading and Level of Text Complexity

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

2.RL.10 By the end of the year, read and comprehend literature, including stories and poetry, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

2.RI.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.

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

2.RI.2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.

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

2.RI.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

2.RI.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

2.RI.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.

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

2.RI.6 Identify the main purpose of a text, including what the author wants to answer, explain, or describe.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Integration of Knowledge and Ideas

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

2.RI.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

Anchor Standard 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.

2.RI.8 Describe how reasons support specific points the author makes in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

2.RI.9 Compare and contrast the most important points presented by two texts on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

2.RI.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

2.RF.1 There is not a grade 2 standard for this concept. Please see preceding grades for more information.

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

2.RF.2 There is not a grade 2 standard for this concept. Please see preceding grades for more information.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

2.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Distinguish long and short vowels when reading regularly spelled one-syllable words.

b. Know spelling-sound correspondences for additional common vowel teams.

c. Decode regularly spelled two-syllable words with long vowels.

d. Decode words with common prefixes and suffixes.

e. Identify words with inconsistent but common spelling-sound correspondences.

f. Recognize and read grade-appropriate irregularly spelled words.

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

2.RF.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.

b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

2.W.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.

Anchor Standard 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.

2.W.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

2.W.3 Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

2.W.4 (Begins in grade 3)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

2.W.5 With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

2.W.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

2.W.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

Anchor Standard 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.

2.W.8 Recall information from experiences or gather information from provided sources to answer a question.

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

2.W.9 (Begins in grade 4)

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

2.W.10 (Begins in grade 3)

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

2.SL.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.

a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

b. Build on others' talk in conversations by linking their comments to the remarks of others.

c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

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

2.SL.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

2.SL.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

Presentation of Knowledge and Ideas

Anchor Standard 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.

2.SL.4 Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.

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

2.SL.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

2.SL.6 Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 2 Language standards 1 and 3 for specific expectations.)

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

2.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Use collective nouns (e.g., group).

b. Form and use frequently occurring irregular plural nouns (e.g., feet, children, teeth, mice, fish).

c. Use reflexive pronouns (e.g., myself, ourselves).

d. Form and use the past tense of frequently occurring irregular verbs (e.g., sat, hid, told).

e. Use adjectives and adverbs, and choose between them depending on what is to be modified.

f. Produce, expand, and rearrange complete simple and compound sentences (e.g., The boy watched the movie; The little boy watched the movie; The action movie was watched by the little boy).

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

2.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Capitalize holidays, product names, and geographic names.

b. Use commas in greetings and closings of letters.

c. Use an apostrophe to form contractions and frequently occurring possessives.

d. Generalize learned spelling patterns when writing words (e.g., cage - badge; boy - boil).

e. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

2.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Compare formal and informal uses of English.

Vocabulary Acquisition and Use

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

2.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 2 reading and content, choosing flexibly from an array of strategies.

a. Use sentence-level context as a clue to the meaning of a word or phrase.

b. Determine the meaning of the new word formed when a known prefix is added to a known word (e.g., happy/unhappy, tell/retell).

c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., addition, additional).

d. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., birdhouse, lighthouse, housefly; bookshelf, notebook, bookmark).

e. Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases.

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

2.L.5 Demonstrate understanding of word relationships and nuances in word meanings.

a. Identify real-life connections between words and their use (e.g., describe foods that are spicy or juicy).

b. Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., thin, slender, skinny, scrawny).

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

2.L.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., When other kids are happy that makes me happy).

Third Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Key Ideas and Details

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

3.RL.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

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

3.RL.2 Recount stories, including fables, folktales, and myths from diverse cultures; determine the central message, lesson, or moral and explain how it is conveyed through key details in the text.

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

3.RL.3 Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

3.RL.4 Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

3.RL.5 Refer to parts of stories, dramas, and poems when writing or speaking about a text, using terms such as chapter, scene, and stanza; describe how each successive part builds on earlier sections.

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

3.RL.6 Distinguish their own point of view from that of the narrator or those of the characters.

Integration of Knowledge and Ideas

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

3.RL.7 Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting).

Anchor Standard 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.

3.RL.8 (Not applicable to literature)

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

3.RL.9 Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series).

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

3.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 2–3 text complexity band independently and proficiently.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

3.RI.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

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

3.RI.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

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

3.RI.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

3.RI.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

3.RI.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

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

3.RI.6 Distinguish their own point of view from that of the author of a text.

Integration of Knowledge and Ideas

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

3.RI.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

Anchor Standard 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.

3.RI.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

3.RI.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

3.RI.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text complexity band independently and proficiently.

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

3.RF.1 There is not a grade 3 standard for this concept. Please see preceding grades for more information.

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

3.RF.2 There is not a grade 3 standard for this concept. Please see preceding grades for more information.

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

3.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Identify and know the meaning of the most common prefixes and derivational suffixes.

b. Decode words with common Latin suffixes.

c. Decode multisyllable words.

d. Read grade-appropriate irregularly spelled words.

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

3.RF.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.

b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

3.W.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

a. Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

b. Provide reasons that support the opinion.

c. Use linking words and phrases (e.g., because, therefore, since, for example) to connect opinion and reasons.

d. Provide a concluding statement or section.

Anchor Standard 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.

3.W.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

b. Develop the topic with facts, definitions, and details.

c. Use linking words and phrases (e.g., also, another, and, more, but) to connect ideas within categories of information.

d. Provide a concluding statement or section.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

3.W.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Establish a situation and introduce a narrator and/or characters; organize an event sequence that unfolds naturally.

b. Use dialogue and descriptions of actions, thoughts, and feelings to develop experiences and events or show the response of characters to situations.

c. Use temporal words and phrases to signal event order.

d. Provide a sense of closure.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

3.W.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

3.W.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 3.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

3.W.6 With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

3.W.7 Conduct short research projects that build knowledge about a topic.

Anchor Standard 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.

3.W.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

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

3.W.9 (Begins in grade 4)

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

3.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

3.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others’ ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

d. Explain their own ideas and understanding in light of the discussion

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

3.SL.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

3.SL.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Presentation of Knowledge and Ideas

Anchor Standard 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.

3.SL.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

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

3.SL.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

3.SL.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 3 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

3.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

a. Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences.

b. Form and use regular and irregular plural nouns.

c. Use abstract nouns (e.g., childhood).

d. Form and use regular and irregular verbs.

e. Form and use the simple (e.g., I walked; I walk; I will walk) verb tenses.

f. Ensure subject-verb and pronoun-antecedent agreement.

g. Form and use comparative and superlative adjectives and adverbs, and choose between them depending on what is to be modified.

h. Use coordinating and subordinating conjunctions.

i. Produce simple, compound, and complex sentences

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

3.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Capitalize appropriate words in titles.

b. Use commas in addresses.

c. Use commas and quotation marks in dialogue.

d. Form and use possessives.

e. Use conventional spelling for high-frequency and other studied words and for adding suffixes to base words (e.g., sitting, smiled, cries, happiness).

f. Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) in writing words.

g. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

3.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Choose words and phrases for effect.

b. Recognize and observe differences between the conventions of spoken and written standard English.

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

3.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

a. Use sentence-level context as a clue to the meaning of a word or phrase.

b. Determine the meaning of the new word formed when a known affix is added to a known word (e.g., agreeable/disagreeable, comfortable/ uncomfortable, care/careless, heat/preheat).

c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., company, companion).

d. Use glossaries or beginning dictionaries, both print and digital, to determine or clarify the precise meaning of key words and phrases.

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

3.L.5 Demonstrate understanding of word relationships and nuances in word meanings.

a. Distinguish the literal and nonliteral meanings of words and phrases in context (e.g., take steps).

b. Identify real-life connections between words and their use (e.g., describe people who are friendly or helpful).

c. Distinguish shades of meaning among related words that describe states of mind or degrees of certainty (e.g., knew, believed, suspected, heard, wondered).

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

3.L.6 Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships (e.g., After dinner that night we went looking for them).

Fourth Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

4.RL.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

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

4.RL.2 Determine a theme of a story, drama, or poem from details in the text; summarize the text.

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

4.RL.3 Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text (e.g., a character's thoughts, words, or actions).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

4.RL.4 Determine the meaning of words and phrases as they are used in a text, including those that allude to significant characters found in mythology (e.g., Herculean).

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

4.RL.5 Explain major differences between poems, drama, and prose, and refer to the structural elements of poems (e.g., verse, rhythm, meter) and drama (e.g., casts of characters, settings, descriptions, dialogue, stage directions) when writing or speaking about a text.

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

4.RL.6 Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.

Integration of Knowledge and Ideas

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

4.RL.7 Make connections between the text of a story or drama and a visual or oral presentation of the text, identifying where each version reflects specific descriptions and directions in the text.

Anchor Standard 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.

4.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

4.RL.9 Compare and contrast the treatment of similar themes and topics (e.g., opposition of good and evil) and patterns of events (e.g., the quest) in stories, myths, and traditional literature from different cultures.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

4.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poetry, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

4.RI.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

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

4.RI.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.

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

4.RI.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

4.RI.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1*.

4.RI.5 Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

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

4.RI.6 Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.

Integration of Knowledge and Ideas

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

4.RI.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Anchor Standard 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.

4.RI.8 Explain how an author uses reasons and evidence to support particular points in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

4.RI.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

4.RI.10 By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

4.RF.1 There is not a grade 4 standard for this concept. Please see preceding grades for more information.

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

4.RF.2 There is not a grade 4 standard for this concept. Please see preceding grades for more information.

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

4.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

4.RF.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.

b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

4.W.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer's purpose.

b. Provide reasons that are supported by facts and details.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

c. Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition).

d. Provide a concluding statement or section related to the opinion presented.

Anchor Standard 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.

4.W.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Provide a concluding statement or section related to the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

4.W.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.

b. Use dialogue and description to develop experiences and events or show the responses of characters to situations.

c. Use a variety of transitional words and phrases to manage the sequence of events.

d. Use concrete words and phrases and sensory details to convey experiences and events precisely.

e. Provide a conclusion that follows from the narrated experiences or events.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

4.W.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

4.W.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 4.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

4.W.6 With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

Anchor Standard 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.

4.W.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

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

4.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply grade 4 Reading standards to literature (e.g., "Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text [e.g., a character's thoughts, words, or actions].").

b. Apply grade 4 Reading standards to informational texts (e.g., "Explain how an author uses reasons and evidence to support particular points in a text").

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

4.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

4.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

b. Follow agreed-upon rules for discussions and carry out assigned roles.

c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

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

4.SL.2 Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

4.SL.3 Identify the reasons and evidence a speaker provides to support particular points.

Presentation of Knowledge and Ideas

Anchor Standard 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.

4.SL.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

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

4.SL.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

4.SL.6 Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (See grade 4 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

4.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Use relative pronouns (who, whose, whom, which, that) and relative adverbs (where, when, why).

b. Form and use the progressive (e.g., I was walking; I am walking; I will be walking) verb tenses.

c. Use modal auxiliaries (e.g., can, may, must) to convey various conditions.

d. Order adjectives within sentences according to conventional patterns (e.g., a small red bag rather than a red small bag).

e. Form and use prepositional phrases.

f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.

g. Correctly use frequently confused words (e.g., to, too, two; there, their).

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

4.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use correct capitalization.

b. Use commas and quotation marks to mark direct speech and quotations from a text.

c. Use a comma before a coordinating conjunction in a compound sentence.

d. Spell grade-appropriate words correctly, consulting references as needed.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

4.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Choose words and phrases to convey ideas precisely.

b. Choose punctuation for effect.

c. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

4.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., definitions, examples, or restatements in text) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., telegraph, photograph, autograph).

c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

4.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Explain the meaning of simple similes and metaphors (e.g., as pretty as a picture) in context.

b. Recognize and explain the meaning of common idioms, adages, and proverbs.

c. Demonstrate understanding of words by relating them to their opposites (antonyms) and to words with similar but not identical meanings (synonyms).

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

4.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

Fifth Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

5.RL.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

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

5.RL.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.

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

5.RL.3 Compare and contrast two or more characters, settings, or events in a story or drama, drawing on specific details in the text (e.g., how characters interact).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5.RL.4 Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

5.RL.5 Explain how a series of chapters, scenes, or stanzas fits together to provide the overall structure of a particular story, drama, or poem.

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

5.RL.6 Describe how a narrator's or speaker's point of view influences how events are described.

Integration of Knowledge and Ideas

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

5.RL.7 Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text (e.g., graphic novel, multimedia presentation of fiction, folktale, myth, poem).

Anchor Standard 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.

5.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

5.RL.9 Compare and contrast stories in the same genre (e.g., mysteries and adventure stories) on their approaches to similar themes and topics.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

5.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 4–5 text complexity band independently and proficiently.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

5.RI.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

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

5.RI.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

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

5.RI.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5.RI.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

5.RI.5 Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

5.RI.6 Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

Integration of Knowledge and Ideas

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

5.RI.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

Anchor Standard 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.

5.RI.8 Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

5.RI.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

5.RI.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

Foundational Skills - These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines.

Print Concepts

Anchor Standard: There are no anchor standards associated with Foundational Skills.

5.RF.1 There is not a grade 5 standard for this concept. Please see preceding grades for more information.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Phonological Awareness

Anchor Standard: There are no anchor standards associated with Foundational Skills.

5.RF.2 There is not a grade 5 standard for this concept. Please see preceding grades for more information.

Phonics and Word Recognition

Anchor Standard: There are no anchor standards associated with Foundational Skills.

5.RF.3 Know and apply grade-level phonics and word analysis skills in decoding words.

a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.

Fluency

Anchor Standard: There are no anchor standards associated with Foundational Skills.

5.RF.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.

b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings.

c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

5.W.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.

b. Provide logically ordered reasons that are supported by facts and details.

c. Link opinion and reasons using words, phrases, and clauses (e.g., consequently, specifically).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

d. Provide a concluding statement or section related to the opinion presented.

Anchor Standard 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.

5.W.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. Introduce a topic clearly, provide a general observation and focus, and group related information logically; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

c. Link ideas within and across categories of information using words, phrases, and clauses (e.g., in contrast, especially).

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Provide a concluding statement or section related to the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

5.W.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.

b. Use narrative techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations.

c. Use a variety of transitional words, phrases, and clauses to manage the sequence of events.

d. Use concrete words and phrases and sensory details to convey experiences and events precisely.

e. Provide a conclusion that follows from the narrated experiences or events.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5.W.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

5.W.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 5.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

5.W.6 With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

5.W.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

Anchor Standard 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.

5.W.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

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

5.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply grade 5 Reading standards to literature (e.g., “Compare and contrast two or more characters, settings, or events in a story or a drama, drawing on specific details in the text [e.g., how characters interact]”).

b. Apply grade 5 Reading standards to informational texts (e.g., “Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point[s]”).

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

5.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 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.

5.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

b. Follow agreed-upon rules for discussions and carry out assigned roles.

c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

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

5.SL.2 Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

5.SL.3 Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.

Presentation of Knowledge and Ideas

Anchor Standard 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.

5.SL.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

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

5.SL.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

5.SL.6 Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation. (See grade 5 Language standards 1 and 3 for specific expectations.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

5.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Explain the function of conjunctions, prepositions, and interjections in general and their function in particular sentences.

b. Form and use the perfect (e.g., I had walked; I have walked; I will have walked) verb tenses.

c. Use verb tense to convey various times, sequences, states, and conditions.

d. Recognize and correct inappropriate shifts in verb tense.

e. Use correlative conjunctions (e.g., either/or, neither/nor).

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

5.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use punctuation to separate items in a series.

b. Use a comma to separate an introductory element from the rest of the sentence.

c. Use a comma to set off the words yes and no (e.g., Yes, thank you), to set off a tag question from the rest of the sentence (e.g., It's true, isn't it?), and to indicate direct address (e.g., Is that you, Steve?).

d. Use underlining, quotation marks, or italics to indicate titles of works.

e. Spell grade-appropriate words correctly, consulting references as needed.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

5.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Expand, combine, and reduce sentences for meaning, reader/listener interest, and style.

b. Compare and contrast the varieties of English (e.g., dialects, registers) used in stories, dramas, or poems.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

5.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., cause/effect relationships and comparisons in text) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., photograph, photosynthesis).

c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

5.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figurative language, including similes and metaphors, in context.

b. Recognize and explain the meaning of common idioms, adages, and proverbs.

c. Use the relationship between particular words (e.g., synonyms, antonyms, homographs) to better understand each of the words.

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

5.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).

Sixth Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

6.RL.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

6.RL.2 Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

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

6.RL.3 Describe how a particular story's or drama's plot unfolds in a series of episodes as well as how the characters respond or change as the plot moves toward a resolution.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

6.RL.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.RL.5 Analyze how a particular sentence, chapter, scene, or stanza fits into the overall structure of a text and contributes to the development of the theme, setting, or plot.

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

6.RL.6 Explain how an author develops the point of view of the narrator or speaker in a text.

Integration of Knowledge and Ideas

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

6.RL.7 Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.

Anchor Standard 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.

6.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

6.RL.9 Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

6.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

6.RI.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

6.RI.2 Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

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

6.RI.3 Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).

Craft and Structure

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

6.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.RI.5 Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.

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

6.RI.6 Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.

Integration of Knowledge and Ideas

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

6.RI.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

Anchor Standard 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.

6.RI.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

6.RI.9 Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

6.RI.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Text Types and Purposes

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

6.W.1 Write arguments to support claims with clear reasons and relevant evidence.

a. Introduce claim(s) and organize the reasons and evidence clearly.

b. Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.

c. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from the argument presented.

Anchor Standard 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.

6.W.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

a. Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate transitions to clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

6.W.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

a. Engage and orient the reader by establishing a context and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.

b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.

c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another.

d. Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events.

e. Provide a conclusion that follows from the narrated experiences or events.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

6.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6.W.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 6.).

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

6.W.6 Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of three pages in a single sitting.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

6.W.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Anchor Standard 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.

6.W.8 Gather relevant information from 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.

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

6.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply grade 6 Reading standards to literature (e.g., "Compare and contrast texts in different forms or genres [e.g., stories and poems; historical novels and fantasy stories] in terms of their approaches to similar themes and topics").

b. Apply grade 6 Reading standards to literary nonfiction (e.g., "Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not").

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

6.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

6.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.

c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.

d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

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

6.SL.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

6.SL.3 Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

Presentation of Knowledge and Ideas

Anchor Standard 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.

6.SL.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

6.SL.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

6.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

6.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Ensure that pronouns are in the proper case (subjective, objective, possessive).

b. Use intensive pronouns (e.g., myself, ourselves).

c. Recognize and correct inappropriate shifts in pronoun number and person.

d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).

e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

6.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.

b. Spell correctly.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

6.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Vary sentence patterns for meaning, reader/listener interest, and style.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

b. Maintain consistency in style and tone.

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

6.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 6 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., audience, auditory, audible).

c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

6.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g., personification) in context.

b. Use the relationship between particular words (e.g., cause/effect, part/whole, item/category) to better understand each of the words.

c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., stingy, scrimping, economical, unwasteful, thrifty).

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

6.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading for Literacy in History/Social Studies - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

6.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources.

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

6.RH.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

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

6.RH.3 Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

6.RH.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.RH.5 Describe how a text presents information (e.g., sequentially, comparatively, causally).

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

6.RH.6 Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

Integration of Knowledge and Ideas

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

6.RH.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

Anchor Standard 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.

6.RH.8 Distinguish among fact, opinion, and reasoned judgment in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

6.RH.9 Analyze the relationship between a primary and secondary source on the same topic.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

6.RH.10 By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Reading for Literacy in Science and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

6.RST.1 Cite specific textual evidence to support analysis of science and technical texts.

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

6.RST.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

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

6.RST.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

6.RST.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.RST.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

6.RST.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas

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

6.RST.7 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).

Anchor Standard 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.

6.RST.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

6.RST.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10 Read and comprehend complex literary and informational texts independently and proficiently.

6.RST.10 By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing for Literacy in History/Social Studies, Science, and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Text Types and Purposes

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

6.WHST.1 Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

6.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

6.WHST.3 Not applicable as a separate requirement. Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

6.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6.WHST.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

6.WHST.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

6.WHST.7 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.

Anchor Standard 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.

6.WHST.8 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.

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

6.WHST.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

6.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Seventh Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Key Ideas and Details

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

7.RL.1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

7.RL.2 Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.

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

7.RL.3 Analyze how particular elements of a story or drama interact (e.g., how setting shapes the characters or plot).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

7.RL.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

7.RL.5 Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.

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

6.RL.6 Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.

Integration of Knowledge and Ideas

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

7.RL.7 Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).

Anchor Standard 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.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

7.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

7.RL.9 Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

7.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

7.RI.1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

7.RI.2 Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

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

7.RI.3 Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

7.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

7.RI.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.

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

7.RI.6 Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.

Integration of Knowledge and Ideas

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

7.RI.7 Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).

Anchor Standard 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.

7.RI.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

7.RI.9 Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

7.RI.10 By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

7.W.1 Write arguments to support claims with clear reasons and relevant evidence.

a. Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

7.W.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

7.W.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.

b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.

c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another.

d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.

e. Provide a conclusion that follows from and reflects on the narrated experiences or events.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

7.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

7.W.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 7.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

7.W.6 Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

7.W.7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

Anchor Standard 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.

7.W.8 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.

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

7.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply grade 7 Reading standards to literature (e.g., “Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history”).

b. Apply grade 7 Reading standards to literary nonfiction (e.g. ,“Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims”).

Range of Writing

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

7.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

7.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.

c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.

d. Acknowledge new information expressed by others and, when warranted, modify their own views.

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

7.SL.2 Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

7.SL.3 Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

Anchor Standard 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.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

7.SL.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

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

7.SL.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

7.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

7.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Explain the function of phrases and clauses in general and their function in specific sentences.

b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.

c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

7.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use a comma to separate coordinate adjectives (e.g., It was a fascinating, enjoyable movie but not He wore an old[,] green shirt).

b. Spell correctly.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

7.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

7.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., belligerent, bellicose, rebel).

c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

7.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g., literary, biblical, and mythological allusions) in context.

b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words.

c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., refined, respectful, polite, diplomatic, condescending).

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

7.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading for Literacy in History/Social Studies - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Key Ideas and Details

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

7.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources.

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

7.RH.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

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

7.RH.3 Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

7.RH.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

7.RH.5 Describe how a text presents information (e.g., sequentially, comparatively, causally).

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

7.RH.6 Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

Integration of Knowledge and Ideas

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

7.RH.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

Anchor Standard 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.

7.RH.8 Distinguish among fact, opinion, and reasoned judgment in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

7.RH.9 Analyze the relationship between a primary and secondary source on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

7.RH.10 By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Reading for Literacy in Science and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

7.RST.1 Cite specific textual evidence to support analysis of science and technical texts.

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

7.RST.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

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

7.RST.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

7.RST.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

7.RST.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

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

7.RST.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas

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

7.RST.7 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).

Anchor Standard 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.

7.RST.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

7.RST.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

7.RST.10 By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing for Literacy in History/Social Studies, Science, and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Text Types and Purposes

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

7.WHST.1 Write arguments focused on discipline-specific content.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

7.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

7.WHST.3 Not applicable as a separate requirement. Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

7.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

7.WHST.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

7.WHST.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

7.WHST.7 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.

Anchor Standard 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.

7.WHST.8 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.

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

7.WHST.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

7.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Eighth Grade

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

8.RL.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

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

8.RL.2 Determine a theme or central idea of a text and analyze its development over the course of the text, including its relationship to the characters, setting, and plot; provide an objective summary of the text.

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

8.RL.3 Analyze how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke a decision.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

8.RL.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

8.RL.5 Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and style.

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

8.RL.6 Analyze how differences in the points of view of the characters and the audience or reader (e.g., created through the use of dramatic irony) create such effects as suspense or humor.

Integration of Knowledge and Ideas

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

8.RL.7 Analyze the extent to which a filmed or live production of a story or drama stays faithful to or departs from the text or script, evaluating the choices made by the director or actors.

Anchor Standard 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.

8.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

8.RL.9 Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

8.RL.10 By the end of the year, read and comprehend literature, including stories, dramas, and poems, at the high end of grades 6–8 text complexity band independently and proficiently.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

8.RI.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

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

8.RI.2 Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.

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

8.RI.3 Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

8.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

8.RI.5 Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.

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

8.RI.6 Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.

Integration of Knowledge and Ideas

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

8.RI.7 Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.

Anchor Standard 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.

8.RI.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

8.RI.9 Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

8.RI.10 By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6–8 text complexity band independently and proficiently.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

8.W.1 Write arguments to support claims with clear reasons and relevant evidence.

a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

8.W.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

8.W.3 Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

b. Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters.

c. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events.

d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.

e. Provide a conclusion that follows from and reflects on the narrated experiences or events.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

8.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

8.W.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 8.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

8.W.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8.W.7 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.

Anchor Standard 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.

8.W.8 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.

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

8.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

a. Apply grade 8 Reading standards to literature (e.g., "Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new").

b. Apply grade 8 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced").

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

8.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

8.SL.1 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.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

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

8.SL.2 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.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

8.SL.3 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.

Presentation of Knowledge and Ideas

Anchor Standard 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.

8.SL.4 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.

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

8.SL.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

8.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 8 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

8.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences.

b. Form and use verbs in the active and passive voice.

c. Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood.

d. Recognize and correct inappropriate shifts in verb voice and mood.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

8.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use punctuation (comma, ellipsis, dash) to indicate a pause or break.

b. Use an ellipsis to indicate an omission.

c. Spell correctly.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

8.L.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.

a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

8.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., precede, recede, secede).

c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

8.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g. verbal irony, puns) in context.

b. Use the relationship between particular words to better understand each of the words.

c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., bullheaded, willful, firm, persistent, resolute).

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

8.L.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading for Literacy in History/Social Studies - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

8.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources.

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

8.RH.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

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

8.RH.3 Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

8.RH.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

8.RH.5 Describe how a text presents information (e.g., sequentially, comparatively, causally).

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

8.RH.6 Identify aspects of a text that reveal an author’s point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).

Integration of Knowledge and Ideas

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

8.RH.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

Anchor Standard 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.

8.RH.8 Distinguish among fact, opinion, and reasoned judgment in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

8.RH.9 Analyze the relationship between a primary and secondary source on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

8.RH.10 By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.

Reading for Literacy in Science and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

8.RST.1 Cite specific textual evidence to support analysis of science and technical texts.

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

8.RST.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

8.RST.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

8.RST.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

8.RST.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

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

8.RST.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integration of Knowledge and Ideas

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

8.RST.7 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).

Anchor Standard 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.

8.RST.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

8.RST.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

8.RST.10 By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing for Literacy in History/Social Studies, Science, and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Text Types and Purposes

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

8.WHST.1 Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

8.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

8.WHST.3 Not applicable as a separate requirement. Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

8.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

8.WHST.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

8.WHST.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8.WHST.7 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.

Anchor Standard 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.

8.WHST.8 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.

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

8.WHST.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

8.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Ninth and Tenth Grades

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

9-10.RL.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

9-10.RL.2 Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

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

9-10.RL.3 Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.

Craft and Structure

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

9-10.RL.4 Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

9-10.RL.5 Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise.

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

9-10.RL.6 Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.

Integration of Knowledge and Ideas

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

9-10.RL.7 Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus).

Anchor Standard 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.

9-10.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

9-10.RL.9 Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare).

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

9-10.RL.10 By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9–10 text complexity band independently and proficiently.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

9-10.RI.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

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

9-10.RI.2 Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

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

9-10.RI.3 Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

9-10.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

9-10.RI.5 Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter).

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

9-10.RI.6 Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.

Integration of Knowledge and Ideas

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

9-10.RI.7 Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

Anchor Standard 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.

9-10.RI.8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

9-10.RI.9 Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

9-10.RI.10 By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.
By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

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

9-10.W.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

9-10.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

9-10.W.3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.

b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.

c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.

d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.

e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Production and Distribution of Writing

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-10.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

9-10.W.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 9–10.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

9-10.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

9-10.W.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Anchor Standard 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.

9-10.W.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

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

9-10.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply grades 9–10 Reading standards to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]").

b. Apply grades 9–10 Reading standards to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

9-10.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

9-10.SL.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

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

9-10.SL.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

9-10.SL.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Presentation of Knowledge and Ideas

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 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.

9-10.SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

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

9-10.SL.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

9-10.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

9-10.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Use parallel structure.

b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

9-10.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.

b. Use a colon to introduce a list or quotation.

c. Spell correctly.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1*.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

9-10.L.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., MLA Handbook, Turabian's Manual for Writers) appropriate for the discipline and writing type.

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

9-10.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy).

c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

9-10.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text.

b. Analyze nuances in the meaning of words with similar denotations.

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

9-10.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Reading for Literacy in History/Social Studies - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

9-10.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.

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

9-10.RH.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.

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

9-10.RH.3 Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

9-10.RH.4 Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

9-10.RH.5 Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.

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

9-10.RH.6 Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.

Integration of Knowledge and Ideas

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

9-10.RH.7 Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.

Anchor Stanard 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.

9-10.RH.8 Assess the extent to which the reasoning and evidence in a text support the author's claims.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

9-10.RH.9 Compare and contrast treatments of the same topic in several primary and secondary sources.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

9-10.RH.10 By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.

Reading for Literacy in Science and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

9-10.RST.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

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

9-10.RST.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

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

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

9-10.RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

9-10.RST.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

9-10.RST.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

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

9-10.RST.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Ideas

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

9-10.RST.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Anchor Standard 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.

9-10.RST.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

9-10.RST.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

9-10.RST.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Writing for Literacy in History/Social Studies, Science, and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Text Types and Purposes

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

9-10.WHST.1 Write arguments focused on discipline-specific content.

a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

Anchor Standard 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.

9-10.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

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f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

9-10.WHST.3 Not applicable as a separate requirement. Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

9-10.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

9-10.WHST.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

9-10.WHST.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

9-10.WHST.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Anchor Standard 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.

9-10.WHST.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

9-10.WHST.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

9-10.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Eleventh and Twelfth Grades

Instruction in the Common Core State Standards (CCSS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects will prepare Oregon students to be proficient in the four strands of the English language arts (ELA) skills—Reading, Writing, Language, and Speaking and Listening. Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Literature - The following standards offer a focus for instruction in literary text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

11-12.RL.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

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

11-12.RL.2 Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.

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

11-12.RL.3 Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

11-12.RL.4 Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

11-12.RL.5 Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.

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

11-12.RL.6 Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).

Integration of Knowledge and Ideas

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

11-12.RL.7 Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)

Anchor Standard 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.

11-12.RL.8 (Not applicable to literature)

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

11-12.RL.9 Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

11-12.RL.10 By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11–CCR text complexity band independently and proficiently.

Informational Text - The following standards offer a focus for instruction in informational text and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades.

Key Ideas and Details

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

11-12.RI.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

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

11-12.RI.2 Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.

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

11-12.RI.3 Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

11-12.RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

11-12.RI.5 Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

11-12.RI.6 Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.

Integration of Knowledge and Ideas

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

11-12.RI.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Anchor Standard 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.

11-12.RI.8 Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., The Federalist, presidential addresses).

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

11-12.RI.9 Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

11-12.RI.10 By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.
By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

Writing - The following standards offer a focus for instruction in writing to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, and they should address increasingly demanding content and sources.

Text Types and Purposes

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

11-12.W.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Anchor Standard 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.

11-12.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

a. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

11-12.W.3 Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.

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b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.

c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).

d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.

e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

11-12.W.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12.)

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

11-12.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

11-12.W.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Anchor Standard 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.

11-12.W.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

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

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

a. Apply grades 11–12 Reading standards to literature (e.g., “Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics”).

b. Apply grades 11–12 Reading standards to literary nonfiction (e.g., “Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., The Federalist, presidential addresses]”).

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

11-12.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Speaking and Listening - The following standards offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Comprehension and Collaboration

Anchor Standard 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.

11-12.SL.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

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

11-12.SL.2 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Anchor Standard 3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

11-12.SL.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Presentation of Knowledge and Ideas

Anchor Standard 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.

11-12.SL.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

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

11-12.SL.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Anchor Standard 6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

11-12.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 for specific expectations.)

Language - The following standards offer a focus for instruction to help ensure that students gain adequate mastery of a range of skills and applications. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

Conventions of Standard English

Anchor Standard 1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

11-12.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.

b. Resolve issues of complex or contested usage, consulting references (e.g., Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage) as needed.

Anchor Standard 2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

11-12.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Observe hyphenation conventions.

b. Spell correctly.

Knowledge of Language

Anchor Standard 3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

11-12.L.3 Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

a. Vary syntax for effect, consulting references (e.g., Tufte's Artful Sentences) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.

Vocabulary Acquisition and Use

Anchor Standard 4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

11-12.L.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.

a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., conceive, conception, conceivable).

c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

Anchor Standard 5: Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

11-12.L.5 Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text.

b. Analyze nuances in the meaning of words with similar denotations.

Anchor Standard 6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

11-12.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading for Literacy in History/Social Studies - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Key Ideas and Details

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

11-12.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.

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

11-12.RH.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.

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

11-12.RH.3 Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

11-12.RH.4 Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

11-12.RH.5 Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.

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

11-12.RH.6 Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.

Integration of Knowledge and Ideas

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

11-12.RH.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Anchor Standard 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.

11-12.RH.8 Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

11-12.RH.9 Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

11-12.RH.10 By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently.

Reading for Literacy in Science and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Key Ideas and Details

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

11-12.RST.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

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

11-12.RST.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

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

11-12.RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

Anchor Standard 4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

11-12.RST.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Anchor Standard 5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

11-12.RST.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

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

11-12.RST.6 Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas

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

11-12.RST.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 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.

11-12.RST.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Anchor Standard 9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

11-12.RST.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

Anchor Standard 10: Read and comprehend complex literary and informational texts independently and proficiently.

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

Writing for Literacy in History/Social Studies, Science, and Technical Subjects - Because students need grade-level literacy skills to access full content in school, the emphasis in the Common Core is to learn to read and write in ELA and to develop those skills, specific to the content, in all other classes. For grades K-5, the ELA and subject-area literacy standards are integrated; for grades 6-11/12, they are separate but parallel.

Text Types and Purposes

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

11-12.WHST.1 Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Anchor Standard 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.

11-12.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Anchor Standard 3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

11-12.WHST.3 Not applicable as a separate requirement. Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Production and Distribution of Writing

Anchor Standard 4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Anchor Standard 5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

11-12.WHST.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Anchor Standard 6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

11-12.WHST.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Research to Build and Present Knowledge

Anchor Standard 7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

11-12.WHST.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Anchor Standard 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.

11-12.WHST.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

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

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

Range of Writing

Anchor Standard 10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

11-12.WHST.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Standards are identified by grade, strand, and number (or number and letter, where applicable); for example, **8.RL.1**, means *grade 8, Reading Literature, standard 1.*

Section 2

Common Core State Standards

Mathematics

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Mathematics (CCSS)

Kindergarten

In Kindergarten, instructional time should focus on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

Mathematical Practices (K.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

K.MP.1 Make sense of problems and persevere in solving them.

K.MP.2 Reason abstractly and quantitatively.

K.MP.3 Construct viable arguments and critique the reasoning of others.

K.MP.4 Model with mathematics.

K.MP.5 Use appropriate tools strategically.

K.MP.6 Attend to precision.

K.MP.7 Look for and make use of structure.

K.MP.8 Look for and express regularity in repeated reasoning.

Counting and Cardinality (K.CC)

A. Know number names and the count sequence.

K.CC.1 Count to 100 by ones and by tens.

K.CC.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

K.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

B. Count to tell the number of objects.

K.CC.4 Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

c. Understand that each successive number name refers to a quantity that is one larger.

K.CC.5 Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

C. Compare numbers.

K.CC.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies. (Include groups with up to ten objects.)

K.CC.7 Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking (K.OA)

D. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. (Drawings need not show details, but should show the mathematics in the problem)

K.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

K.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

K.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

K.OA.5 Fluently add and subtract within 5.

Number and Operations in Base Ten (K.NBT)

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

E. Work with numbers 11–19 to gain foundations for place value.

K.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Measurement and Data (K.MD)

F. Describe and compare measurable attributes.

K.MD.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference.

G. Classify objects and count the number of objects in each category.

K.MD.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count. (Limit category counts to be less than or equal to 10.)

Geometry (K.G)

H. Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

K.G.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

K.G.2 Correctly name shapes regardless of their orientations or overall size.

K.G.3 Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).

I. Analyze, compare, create, and compose shapes.

K.G.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).

K.G.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

K.G.6 Compose simple shapes to form larger shapes.

First Grade

Mathematical Practices (1.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1.MP.1 Make sense of problems and persevere in solving them.

1.MP.2 Reason abstractly and quantitatively.

1.MP.3 Construct viable arguments and critique the reasoning of others.

1.MP.4 Model with mathematics.

1.MP.5 Use appropriate tools strategically.

1.MP.6 Attend to precision.

1.MP.7 Look for and make use of structure.

1.MP.8 Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking (1.OA)

A. Represent and solve problems involving addition and subtraction.

1.OA.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

1.OA.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

B. Understand and apply properties of operations and the relationship between addition and subtraction.

1.OA.3 Apply properties of operations as strategies to add and subtract. (Students need not use formal terms for these properties.)

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1.OA.4 Understand subtraction as an unknown-addend problem.

C. Add and subtract within 20.

1.OA.5 Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

1.OA.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

D. Work with addition and subtraction equations.

1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.

1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating to three whole numbers.

Number and Operations in Base Ten (1.NBT)

E. Extend the counting sequence.

1.NBT.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

F. Understand place value.

1.NBT.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

a. 10 can be thought of as a bundle of ten ones — called a “ten.”

b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

1.NBT.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

G. Use place value understanding and properties of operations to add and subtract.

1.NBT.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Measurement and Data (1.MD)

H. Measure lengths indirectly and by iterating length units.

1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.MD.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

I. Tell and write time.

1.MD.3 Tell and write time in hours and half-hours using analog and digital clocks.

J. Represent and interpret data.

1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Geometry (1.G)

K. Reason with shapes and their attributes.

1.G.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

1.G.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape. (Students do not need to learn formal names such as “right rectangular prism.”)

1.G.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Second Grade

Mathematical Practices (2.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

2.MP.1 Make sense of problems and persevere in solving them.

2.MP.2 Reason abstractly and quantitatively.

2.MP.3 Construct viable arguments and critique the reasoning of others.

2.MP.4 Model with mathematics.

2.MP.5 Use appropriate tools strategically.

2.MP.6 Attend to precision.

2.MP.7 Look for and make use of structure.

2.MP.8 Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking (2.OA)

A. Represent and solve problems involving addition and subtraction.

2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

B. Add and subtract within 20.

2.OA.2 Fluently add and subtract within 20 using mental strategies. (See standard 1.OA.6 for a list of mental strategies.) By end of Grade 2, know from memory all sums of two one-digit numbers.

C. Work with equal groups of objects to gain foundations for multiplication.

2.OA.3 Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.

2.OA.4 Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

Number and Operations in Base Ten (2.NBT)

D. Understand place value.

2.NBT.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

a. 100 can be thought of as a bundle of ten tens — called a "hundred."

b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

2.NBT.2 Count within 1000; skip-count by 5s, 10s, and 100s.

2.NBT.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

2.NBT.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

E. Use place value understanding and properties of operations to add and subtract.

2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.

2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

2.NBT.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

2.NBT.9 Explain why addition and subtraction strategies work, using place value and the properties of operations. (Explanations may be supported by drawings or objects.)

Measurement and Data (2.MD)

F. Measure and estimate lengths in standard units.

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

G. Relate addition and subtraction to length.

2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

2.MD.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

H. Work with time and money.

2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.

I. Represent and interpret data.

2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

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2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.

Geometry (2.G)

J. Reason with shapes and their attributes.

2.G.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. (Sizes are compared directly or visually, not compared by measuring.) Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

2.G.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Third Grade

Mathematical Practices (3.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

3.MP.1 Make sense of problems and persevere in solving them.

3.MP.2 Reason abstractly and quantitatively.

3.MP.3 Construct viable arguments and critique the reasoning of others.

3.MP.4 Model with mathematics.

3.MP.5 Use appropriate tools strategically.

3.MP.6 Attend to precision.

3.MP.7 Look for and make use of structure.

3.MP.8 Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking (3.OA)

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A. Represent and solve problems involving multiplication and division.

3.OA.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.

3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

3.OA.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

B. Understand properties of multiplication and the relationship between multiplication and division.

3.OA.5 Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.)

3.OA.6 Understand division as an unknown-factor problem.

C. Multiply and divide within 100.

3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

D. Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order [Order of Operations].)

3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.

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Number and Operations in Base Ten (3.NBT)

E. Use place value understanding and properties of operations to perform multi-digit arithmetic. (A range of algorithms may be used)

3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

Number and Operations - Fractions (3.NF)
(Grade 3 expections in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8)

F. Develop understanding of fractions as numbers.

3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.

3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.

b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

3.NF.3 Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

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Measurement and Data (3.MD)

G. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (Excludes multiplicative comparison problems [problems involving notions of “times as much”; see Glossary, Table 2])

H. Represent and interpret data.

3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs.

3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

I. Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD.5 Recognize area as an attribute of plane figures and understand concepts of area measurement.

a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.

b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.

3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

3.MD.7 Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

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b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.

d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

J. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

3.MD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Geometry (6.G)

K. Reason with shapes and their attributes.

3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

Fourth Grade

Mathematical Practices (4.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

4.MP.1 Make sense of problems and persevere in solving them.

4.MP.2 Reason abstractly and quantitatively.

4.MP.3 Construct viable arguments and critique the reasoning of others.

4.MP.4 Model with mathematics.

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4.MP.5 Use appropriate tools strategically.

4.MP.6 Attend to precision.

4.MP.7 Look for and make use of structure.

4.MP.8 Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking (4.OA)

A. Use the four operations with whole numbers to solve problems.

4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

4.OA.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

B. Gain familiarity with factors and multiples.

4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

C. Generate and analyze patterns.

4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Number and Operations in Base Ten (4.NBT)(Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.)

D. Generalize place value understanding for multi-digit whole numbers.

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4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.

4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

E. Use place value understanding and properties of operations to perform multi-digit arithmetic.

4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Number and Operations - Fractions (4.NF)(Grade 4 expections in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12 and 100.)

F. Extend understanding of fraction equivalence and ordering.

4.NF.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

G. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

4.NF.3 Understand a fraction a/b with a > 1 as a sum of fractions 1/b.

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

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b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction a/b as a multiple of 1/b.

b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number.

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.

H. Understand decimal notation for fractions, and compare decimal fractions.

4.NBT.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.

4.NBT.6 Use decimal notation for fractions with denominators 10 or 100.

4.NBT.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

Measurement and Data (4.MD)

I. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table.

4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

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J. Represent and interpret data.

4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.

K. Geometric measurement: understand concepts of angle and measure angles.

4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles.

b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Geometry (4.G)

L. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Fifth Grade

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Mathematical Practices (5.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

5.MP.1 Make sense of problems and persevere in solving them.

5.MP.2 Reason abstractly and quantitatively.

5.MP.3 Construct viable arguments and critique the reasoning of others.

5.MP.4 Model with mathematics.

5.MP.5 Use appropriate tools strategically.

5.MP.6 Attend to precision.

5.MP.7 Look for and make use of structure.

5.MP.8 Look for and express regularity in repeated reasoning.

Operations and Algebraic Thinking (5.OA)

A. Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

B. Analyze patterns and relationships.

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

Number and Operations in Base Ten (5.NBT)

B. Understand the place value system.

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5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.3 Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.4 Use place value understanding to round decimals to any place.

C. Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Number and Operations - Fractions (5.NF)

D. Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

E. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

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5.NF.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.

b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.5 Interpret multiplication as scaling (resizing), by:

a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n\times a)/(n\times b)$ to the effect of multiplying a/b by 1.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.

b. Interpret division of a whole number by a unit fraction, and compute such quotients.

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.

Measurement and Data (5.MD)

F. Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

G. Represent and interpret data.

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.

H. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.

b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Geometry (5.G)

I. Graph points on the coordinate plane to solve real-world and mathematical problems.

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

J. Classify two-dimensional figures into categories based on their properties.

5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

5.G.4 Classify two-dimensional figures in a hierarchy based on properties.

Sixth Grade

Mathematical Practices (6.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

6.MP.1 Make sense of problems and persevere in solving them.

6.MP.2 Reason abstractly and quantitatively.

6.MP.3 Construct viable arguments and critique the reasoning of others.

6.MP.4 Model with mathematics.

6.MP.5 Use appropriate tools strategically.

6.MP.6 Attend to precision.

6.MP.7 Look for and make use of structure.

6.MP.8 Look for and express regularity in repeated reasoning.

Ratios and Proportional Relationships (6.RP)

A. Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

6.RP.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b does not equal 0, and use rate language in the context of a ratio relationship.

6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

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b. Solve unit rate problems including those involving unit pricing and constant speed.

c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

The Number System (6.NS)

B. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

C. Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.

6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

D. Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.

b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

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c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.NS.7 Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

d. Distinguish comparisons of absolute value from statements about order.

6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Expressions and Equations (6.EE)

E. Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.

6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers.

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

6.EE.3 Apply the properties of operations to generate equivalent expressions.

6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

F. Reason about and solve one-variable equations and inequalities.

6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

6.EE.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

G. Represent and analyze quantitative relationships between dependent and independent variables.

6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Geometry (6.G)

H. Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Statistics and Probability (6.SP)

I. Develop understanding of statistical variability.

6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

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6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

J. Summarize and describe distributions.

6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.5 Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Seventh Grade

Mathematical Practices (7.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

7.MP.1 Make sense of problems and persevere in solving them.

7.MP.2 Reason abstractly and quantitatively.

7.MP.3 Construct viable arguments and critique the reasoning of others.

7.MP.4 Model with mathematics.

7.MP.5 Use appropriate tools strategically.

7.MP.6 Attend to precision.

7.MP.7 Look for and make use of structure.

7.MP.8 Look for and express regularity in repeated reasoning.

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Ratios and Proportional Relationships (7.RP)

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

7.RP.2 Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

7.RP.3 Use proportional relationships to solve multistep ratio and percent problems.

The Number System (7.NS)

B. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0.

b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

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b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

Expressions and Equations (7.EE)

C. Use properties of operations to generate equivalent expressions.

7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

D. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Geometry (7.G)

E. Draw, construct and describe geometrical figures and describe the relationships between them.

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7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

F. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics and Probability (7.SP)

G. Use random sampling to draw inferences about a population.

7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

H. Draw informal comparative inferences about two populations.

7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

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I. Investigate chance processes and develop, use, and evaluate probability models.

7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

7.SP.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events.

Eighth Grade

Mathematical Practices (8.MP)

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

8.MP.1 Make sense of problems and persevere in solving them.

8.MP.2 Reason abstractly and quantitatively.

8.MP.3 Construct viable arguments and critique the reasoning of others.

8.MP.4 Model with mathematics.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

8.MP.5 Use appropriate tools strategically.

8.MP.6 Attend to precision.

8.MP.7 Look for and make use of structure.

8.MP.8 Look for and express regularity in repeated reasoning.

The Number System (8.NS)

A. Know that there are numbers that are not rational, and approximate them by rational numbers.

8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g. pi^2).

Expressions and Equations (8.EE)

B. Work with radicals and integer exponents.

8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that the square root of 2 is irrational.

8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

C. Understand the connections between proportional relationships, lines, and linear equations.

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

D. Analyze and solve linear equations and pairs of simultaneous linear equations.

8.EE.7 Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.8 Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

c. Solve real-world and mathematical problems leading to two linear equations in two variables.

Functions (8.F)

E. Define, evaluate, and compare functions.

8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8).

8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

8.F.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

F. Use functions to model relationships between quantities.

8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry (8.G)

G. Understand congruence and similarity using physical models, transparencies, or geometry software.

8.G.1 Verify experimentally the properties of rotations, reflections, and translations:

a. Lines are taken to lines, and line segments to line segments of the same length.

b. Angles are taken to angles of the same measure.

c. Parallel lines are taken to parallel lines.

8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

H. Understand and apply the Pythagorean Theorem.

8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

I. Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

Statistics and Probability (8.SP)

J. Investigate patterns of association in bivariate data.

8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

K-8 standards are grouped by cluster, and identified by grade, domain, and number; for example, **4.OA.3**, means *grade 4, Operations and Algebraic Thinking, standard 3*. In High School, standards are grouped by conceptual category, domain, and number; for example, **A.CED.1**, means *Algebra, Creating Equations, standard 1*.

Oregon State Standards

Oregon State Standards, CCSS, and NGSS

Section 3

Oregon State Standards

Arts

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Arts

Third Grade

Benchmark 1 (Grades K-3) students explore basic skills in creating works of art, responding and analyzing works of art, and understanding the relationships between works of art and their community. Students explore the creative process, using essential elements and organizational principles of different arts disciplines for expression. Students recognize and describe those elements and principles in other works of art and identify personal preferences. Students identify an event or condition that influenced a work of art, and cultural characteristics of a work of art. Students also describe the place of the arts in their community.

Create, Present, And Perform

Create, present and perform works of art.

AR.03.CP.01 Use experiences, imagination, essential elements and organizational principles to achieve a desired effect when creating, presenting and/or performing works of art.

Apply the use of ideas, techniques and problem solving to the creative process and analyze the influence that choices have on the result.

AR.03.CP.02 Explore aspects of the creative process and the effect of different choices on one's work.

Express ideas, moods and feelings through the arts and evaluate how well a work of art expresses one's intent.

AR.03.CP.03 Create, present and/or perform a work of art that demonstrates an idea, mood or feeling.

Evaluate one's own work, orally and in writing.

AR.03.CP.04 Describe how one's own work reveals knowledge of the arts, orally and in writing.

Aesthetics And Criticism

Apply critical analysis to works of art.

AR.03.AC.01 Recognize essential elements, organizational principles and aesthetic effects in works of art.

Respond to works of art and give reasons for preferences.

AR.03.AC.02 Identify and describe personal preferences connected with viewing or listening to a work of art using terminology that conveys knowledge of the arts.

Understand the interrelationships among art forms.

AR.03.AC.03 Identify the disciplines used in an integrated work of art.

Historical And Cultural Perspectives

Understand how events and conditions influence the arts.

AR.03.HC.01 Identify an event or condition that influenced a work of art.

Distinguish works of art from different societies, time periods and cultures.

AR.03.HC.02 Identify social, historical and cultural characteristics in a work of art.

Understand how the arts can reflect the environment and personal experiences within a society or culture, and apply to one's own work.

AR.03.HC.03 Describe how art from the student's community reflects the artist's environment and culture.

Understand the place of the arts within, and their influences on, society.

AR.03.HC.04 Describe how the arts serve a variety of purposes in the student's life, community and culture.

AR.03.HC.05 Recognize how the arts can influence an individual's life.

Fifth Grade

Benchmark 2 (Grades 4-5) students begin to refine their control over essential elements and organizational principles while identifying the creative process they use and how their choices affect their final expression. Students identify how essential elements and organizational principles contribute to their preferences, identify aesthetic criteria that can be used to analyze works of art, and select which to use to critique their own work. Students begin to describe the influences on works of art and relate common characteristics that reflect social contexts. Students describe how works of art reflect their society, the purposes they serve, and the influences they have on that society.

Create, Present, And Perform

Create, present and perform works of art.

AR.05.CP.01 Use experiences, imagination, observations, essential elements and organizational principles to achieve a desired effect when creating, presenting and/or performing works of art.

Apply the use of ideas, techniques and problem solving to the creative process and analyze the influence that choices have on the result.

AR.05.CP.02 Identify the creative process used, and the choices made, when combining ideas, techniques and problem solving to produce one's work.

Express ideas, moods and feelings through the arts and evaluate how well a work of art expresses one’s intent.

AR.05.CP.03 Create, present and/or perform a work of art and explain how the use of essential elements and organizational principles shapes an idea, mood or feeling found in the work.

Evaluate one's own work, orally and in writing.

AR.05.CP.04 Critique one's own work using self-selected criteria that reveal knowledge of the arts, orally and in writing.

Aesthetics And Criticism

Apply critical analysis to works of art.

AR.05.AC.01 Identify essential elements, organizational principles and aesthetic criteria that can be used to analyze works of art.

Respond to works of art and give reasons for preferences.

AR.05.AC.02 Describe personal preferences and identify how essential elements and organizational principles in a work of art contribute to those preferences.

Understand the interrelationships among art forms.

AR.05.AC.03 Describe how essential elements and organizational principles from various arts disciplines are used in an integrated work of art.

Historical And Cultural Perspectives

Understand how events and conditions influence the arts.

AR.05.HC.01 Identify and describe the influence of events and/or conditions on works of art.

Distinguish works of art from different societies, time periods and cultures.

AR.05.HC.02 Identify and relate common and unique characteristics in works of art that reflect social, historical, and cultural contexts.

Understand how the arts can reflect the environment and personal experiences within a society or culture, and apply to one's own work.

AR.05.HC.03 Describe how works of art from various historic periods reflect the artist's environment, society and culture.

Understand the place of the arts within, and their influences on, society.

AR.05.HC.04 Describe how the arts serve a variety of purposes and needs in other communities and cultures.

AR.05.HC.05 Describe how the arts have influenced various communities and cultures.

Eighth Grade

Benchmark 3 (Grades 6-8) students select and combine essential elements and organizational principles when creating works of art, describe the creative process used, and begin to control the elements and principles to refine their expression. Students use aesthetic criteria to describe their preferences, critique their own work, describe other works of art, and identify how the elements and principles contribute to an aesthetic effect. Students distinguish the influences on works of art and compare and contrast works of art from different cultures. They explain how works of art reflect their contexts, how the arts serve a variety of purposes in a society, and the influences of the arts on individuals and society.

Create, Present, And Perform

Create, present and perform works of art.

AR.08.CP.01 Select and combine essential elements and organizational principles to achieve a desired effect when creating, presenting and/or performing works of art.

Apply the use of ideas, techniques and problem solving to the creative process and analyze the influence that choices have on the result.

AR.08.CP.02 Describe the creative process used, and the effects of the choices made, when combining ideas, techniques, and problem solving to produce one's work.

Express ideas, moods and feelings through the arts and evaluate how well a work of art expresses one’s intent.

AR.08.CP.03 Create, present and/or perform a work of art by controlling essential elements and organizational principles to express an intended idea, mood or feeling.

Evaluate one's own work, orally and in writing.

AR.08.CP.04 Critique the artistic choices made in creating a work of art and their impact on the aesthetic effect, orally and in writing.

Aesthetics And Criticism

Apply critical analysis to works of art.

AR.08.AC.01 Use knowledge of essential elements, organizational principles and aesthetic criteria to describe works of art and identify how the elements and principles contribute to the aesthetic effect.

Respond to works of art and give reasons for preferences.

AR.08.AC.02 Describe personal preferences for works of art using aesthetic criteria and identify how essential elements and organizational principles contribute to the aesthetic effect.

Understand the interrelationships among art forms.

AR.08.AC.03 Explain the distinctive ways that essential elements and organizational principles from various arts disciplines are used in an integrated work of art and identify their impact on that work.

Historical And Cultural Perspectives

Understand how events and conditions influence the arts.

AR.08.HC.01 Distinguish the influence of events and conditions on works of art.

Distinguish works of art from different societies, time periods and cultures.

AR.08.HC.02 Identify and relate works of art from different societies, time periods and cultures, emphasizing their common and unique characteristics.

Understand how the arts can reflect the environment and personal experiences within a society or culture, and apply to one's own work.

AR.08.HC.03 Explain how works of art from around the world reflect the artist's environment, society and culture.

Understand the place of the arts within, and their influences on, society.

AR.08.HC.04 Explain how the arts serve a variety of purposes, needs and values in different communities and cultures.

AR.08.HC.05 Explain the influence of the arts on individuals, communities and cultures in various time periods.

High School

High school students create works of art for a variety of purposes, explain their creative process, control the essential elements and organizational principles, and describe how well their expression reflects their intentions. They critique the artistic merit of their own work, and of other works, and explain their preferences based on an analysis of how well the elements and principles of a work contribute to its artistic merit. Students explain the influences on an artist's body of work and describe common and unique characteristics of works of art from different cultures. Students apply the knowledge of how works of art reflect their contexts to their own work, explain the connections between the arts and society, and explain the influence of the arts on individual and cultural behavior and traditions.

Create, Present, And Perform

Create, present and perform works of art.

AR.HS.CP.01 Select and combine essential elements and organizational principles to achieve a desired effect when creating, presenting and/or performing works of art for a variety of purposes.

Apply the use of ideas, techniques and problem solving to the creative process and analyze the influence that choices have on the result.

AR.HS.CP.02 Explain the choices made in the creative process when combining ideas, techniques, and problem solving to produce one's work, and identify the impact that different choices might have made.

Express ideas, moods and feelings through the arts and evaluate how well a work of art expresses one’s intent.

AR.HS.CP.03 Create, present and/or perform a work of art by controlling essential elements and organizational principles and describe how well the work expresses an intended idea, mood or feeling.

Evaluate one's own work, orally and in writing.

AR.HS.CP.04 Critique the artistic merit of one's own work using aesthetic criteria, orally and in writing.

Aesthetics And Criticism

Apply critical analysis to works of art.

AR.HS.AC.01 Use knowledge of essential elements, organizational principles and aesthetic criteria to explain the artistic merit and aesthetic effect of a work of art.

Respond to works of art and give reasons for preferences.

AR.HS.AC.02 Explain personal preferences for works of art based on an analysis of how the essential elements and organizational principles contribute to the work's artistic merit.

Understand the interrelationships among art forms.

AR.HS.AC.03 Explain the roles of essential elements and organizational principles from various arts disciplines in an integrated work of art and identify how they contribute to the aesthetic effect, overall idea and impact of the work.

Historical And Cultural Perspectives

Understand how events and conditions influence the arts.

AR.HS.HC.01 Explain the influence of events and conditions on an artist's work.

Distinguish works of art from different societies, time periods and cultures.

AR.HS.HC.02 Describe and distinguish works of art from different societies, time periods, and cultures, emphasizing their common and unique characteristics.

Understand how the arts can reflect the environment and personal experiences within a society or culture, and apply to one's own work.

AR.HS.HC.03 Explain how works of art reflect the artist's personal experience, environment, society and culture and apply this knowledge to one's own work.

Understand the place of the arts within, and their influences on, society.

AR.HS.HC.04 Explain the connections among the arts, career opportunities, and quality of life in the context of personal, practical, community and cultural needs.

AR.HS.HC.05 Explain the influence of the arts on human behavior, community life and cultural traditions.

Section 4

Oregon State Standards

Career-Related Learning

ONREP
Oregon Natural Resources Education Program
~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Career-Related Learning

CRLS Benchmark 1

Personal Management

Develop competence in personal management that contributes to fulfilling and balancing responsibilities of multiple life roles (i.e., individual, learner, producer, consumer, family member, citizen).

Exhibit appropriate work ethic and behaviors in school, community, and workplace.

Describe responsibilities of a student.

Identify the impact of one's own behavior on other individuals and groups.

Demonstrate skills and behaviors necessary to get along with others: respect, sharing, helping, and caring.

Problem Solving

Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Apply decision-making and problem-solving techniques in school, community, and workplace.

Identify and describe a problem that exists in the classroom, school, or community.

Describe how decisions affect self and others.

Discuss how choices are made and what can be learned from making choices and accepting responsibility.

Identify factors associated with making an important decision.

Communication

Select and use appropriate communication strategies in family, school, community, and workplace settings.

Demonstrate effective communication skills to give and receive information in school, community, and workplace.

Explore the use of a variety of traditional and technological tools to acquire information.

Demonstrative attentive listening by following instructions and asking questions.

Locate information using illustrations, tables of contents, glossaries, indexes, headings, graphs, charts, diagrams, and/or tables.

Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, stories, reports) appropriate to audience and purpose.

Demonstrate some control of eye contact and speak at an appropriate rate and volume to request information or assistance.

Teamwork

Develop and use interpersonal skills that contribute to cooperation and teamwork in working toward common goals in family, school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Describe how family members rely on one another, work together, and share responsibilities.

Identify cooperative skills such as helping, sharing, explaining, and listening.

Understand the issues related to diversity in school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Recognize and appreciate the ethnic and cultural diversity found in one's school.

Participate in a cooperative project with classmates.

Employment Foundations

Integrate academic, technical and organizations knowledge and skills to work successfully in family, school, community, and workplace settings.

Demonstrate academic, technical, and organizational knowledge and skills required for successful employment.

Explain how learning in school relates to home, community, and careers.

Participate in the development of classroom rules and guidelines.

Identify uses of technology in home, community, and jobs.

Demonstrate knowledge of good health habits, including healthy ways of dealing with conflict and emotions.

Describe activities that promote safety in the home, school, community, and careers.

Explain how students, teachers, and aides working together contribute to a successful classroom.

Identify and follow classroom processes and procedures.

Identify recent changes in one's own neighborhood and school

Demonstrate promptness, dependability, and getting along with others.

Career Development

Develop skills to assess personal characteristics, interests, abilities, and strengths.

Demonstrate career development skills in planning for post high school experiences.

Identify positive characteristics about self.

Identify hobbies and activities of interest.

Describe various roles in a person's life (e.g., friend, student, worker, family member).

Describe one's role as an important member of family, community, and school groups.

Describe the jobs/occupations of parents, relatives, adult friends, and neighbors.

Describe the relationship between work and learning.

Recognize how learning in school can be used in the home and community.

Describe why people plan for the future.

CRLS Benchmark 2

Personal Management

Develop competence in personal management that contributes to fulfilling and balancing responsibilities of multiple life roles (i.e., individual, learner, producer, consumer, family member, citizen).

Exhibit appropriate work ethic and behaviors in school, community, and workplace.

Describe the importance of personal responsibility and good work habits in the family, school, and community.

Demonstrate how one's behavior impacts outcomes and consequences.

Identify potential sources of conflict with classmates and family members, and suggest strategies for resolving them.

Problem Solving

Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Apply decision-making and problem-solving techniques in school, community, and workplace.

Present a problem's main idea with detail to show understanding of relevant issues.

Examine alternative decisions and their impact on other individuals.

Use decision-making and problem solving to complete a classroom project.

Use information to select middle school electives and plan extra-curricular activities.

Communication

Select and use appropriate communication strategies in family, school, community, and workplace settings.

Demonstrate effective communication skills to give and receive information in school, community, and workplace.

Use a variety of traditional and technological tools to gather information.

Attentively listen to the ideas of others and ask clarifying questions.

Locate information and clarify meaning by using illustrations, tables of contents, glossaries, indexes, headings, graphs, charts, diagrams, and/or tables.

Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, stories, reports) appropriate to audience and purpose.

Demonstrate control of eye contact, speaking rate, volume, enunciation, and gestures when giving instructions, asking questions, and/or providing information.

Teamwork

Develop and use interpersonal skills that contribute to cooperation and teamwork in working toward common goals in family, school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Identify behaviors that promote or interfere with group work (e.g., cooperation, compromise, good listening).

Identify different individuals' contributions to team efforts in families and classrooms.

Understand the issues related to diversity in school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Demonstrate the ability to work as part of a diverse group.

Practice effective team skills including: involving all team members, attentive listening, and completing team tasks.

Employment Foundations

Integrate academic, technical and organizations knowledge and skills to work successfully in family, school, community, and workplace settings.

Demonstrate academic, technical, and organizational knowledge and skills required for successful employment.

Investigate the academic knowledge and technical skills needed in a variety of occupational groups.

Describe the purpose of rules and guidelines in different life role settings.

Describe how technology affects personal, educational, and career/life goals.

Identify personal sources of stress and conflict, and suggest strategies for managing them.

Identify potential safety hazards within the home, school, community, and careers.

Identify how work done by different parts of the school contributes to the school's total operation.

Identify productive and unproductive ways of functioning within family, school, and community settings.

Examine the cause and effect relationship of change in the neighborhood and school.

Demonstrate behaviors and skills (e.g., punctuality, dependability, getting along with others) that are important in various life roles.

Career Development

Develop skills to assess personal characteristics, interests, abilities, and strengths.

Demonstrate career development skills in planning for post high school experiences.

Identify positive characteristics about self, personal interests, and abilities.

Recognize how hobbies and interests may lead to a career interest.

Identify the life roles that individuals experience (i.e., learner, producer, individual, citizen, consumer, and family member).

Identify and describe the roles of families and communities in teaching and supporting their members.

Develop skills to use career information.

Explore occupational groups in relation to hobbies, activities, and interests.

Identify how the knowledge and skills taught in school subjects are used in broad occupational groups.

Demonstrate how to set and achieve short and long term goals.

Identify the relationship between educational planning, goal setting and future success.

Develop skills in identifying, evaluating, and using a variety of resources for exploring personal, educational, and career choices.

Demonstrate career development skills in planning for post high school experiences.

Select middle/junior high school electives based on interests and aptitudes.

CRLS Benchmark 3

Personal Management

Develop competence in personal management that contributes to fulfilling and balancing responsibilities of multiple life roles (i.e., individual, learner, producer, consumer, family member, citizen).

Exhibit appropriate work ethic and behaviors in school, community, and workplace.

Demonstrate good work habits in various family, school, and community related tasks.

Recognize and explain the differences between socially responsible and socially irresponsible behaviors.

Describe one's interactions with community authority figures, and identify how these interactions influence self and others.

Problem Solving

Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Apply decision-making and problem-solving techniques in school, community, and workplace.

Select and use appropriate strategies to solve problems related to life roles.

Distinguish between alternatives that involve varying degrees of risk.

Use information to make decisions and solve problems related to family, school, and community situations.

Use a prioritizing or decision-making process to select and plan high school course of study and extra-curricular activities.

Communication

Select and use appropriate communication strategies in family, school, community, and workplace settings.

Demonstrate effective communication skills to give and receive information in school, community, and workplace.

Use a variety of traditional and technological tools to transmit and receive information.

Attentively listen to, record, and paraphrase the ideas of others

Locate and organize information from relevant sources (e.g., manuals, books, experts, Internet).

Write in a variety of modes (e.g., narrative, imaginative, expository, persuasive) and forms (e.g., essays, letters, business communications, research papers, technical reports) appropriate to audience and purpose.

Demonstrate control of eye contact, speaking rate, volume, enunciation, and gestures when giving instructions, asking questions, and/or providing information.

Teamwork

Develop and use interpersonal skills that contribute to cooperation and teamwork in working toward common goals in family, school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Identify roles and behaviors that contribute to team effectiveness in families, school, and the community.

Examine one’s own role and performance in family, schools, and community team efforts (e.g., leader, follower, team member, facilitator).

Understand the issues related to diversity in school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Explain how diversity contributes to school, community, and workplace teams.

Use strategies to work effectively with team members (e.g., negotiation, compromise, consensus, conflict resolution).

Employment Foundations

Integrate academic, technical and organizations knowledge and skills to work successfully in family, school, community, and workplace settings.

Demonstrate academic, technical, and organizational knowledge and skills required for successful employment.

Investigate and explain the academic knowledge and technical skills needed for a variety of occupational groups.

Explain how organizational rules, laws, and guidelines are developed and implemented to ensure quality, order, security, and safety.

Relate the use of technology to the achievement of personal, educational, and career/life goals.

Demonstrate healthy ways to deal with stress and conflict.

Propose and test solutions to safety hazards within the home, school, community, and careers.

Compare and contrast simple systems and organizations, showing their common elements and relationships (e.g., families, schools, communities, and workplaces).

Participate in a collaborative class project, and describe personal contributions in relationship to the contributions of others.

Describe how work and the workplace are changing (e.g., telecommuting, home-based businesses, entrepreneurial ventures).

Demonstrate knowledge and skills basic to succeeding in multiple life roles (e.g., productive use of time and resources, timely completion of tasks).

Career Development

Develop skills to assess personal characteristics, interests, abilities, and strengths.

Demonstrate career development skills in planning for post high school experiences.

Describe the knowledge and skills needed for multiple life roles in relation to personal characteristics, interests, and abilities.

Describe the interrelationship among family, career, and leisure decisions.

Recognize the impact of family, career, and leisure decisions on various life roles.

Use family and community resources to explore personal and career goals

Demonstrate skills in locating, evaluating, and interpreting career information.

Recognize that interests, occupations, careers, and work may be organized and described in many different ways.

Describe the education and skills needed for a variety of occupations, including self-employment and entrepreneurial ventures.

Determine individual career exploration goals and develop plans to reach them

Recognize the possibility and importance of future unanticipated personal, educational, and career opportunities.

Develop skills in identifying, evaluating, and using a variety of resources for exploring personal, educational, and career choices.

Demonstrate career development skills in planning for post high school experiences.

Forecast a personalized four-year high school plan based on individual goals, interests, and tentative next steps after high school.

Demonstrate job-seeking skills (e.g., writing resumes, completing applications, and participating in interviews.

CRLS Benchmark 4

Personal Management

Develop competence in personal management that contributes to fulfilling and balancing responsibilities of multiple life roles (i.e., individual, learner, producer, consumer, family member, citizen).

Exhibit appropriate work ethic and behaviors in school, community, and workplace.

Take initiative to complete work in a responsible manner.

Use verbal, nonverbal, and written communication skills to interact with classmates, teachers, family, and community members.

Problem Solving

Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Apply decision-making and problem-solving techniques in school, community, and workplace.

Generalize problem-solving strategies to new contexts or situations.

Resolve problems using techniques that include personal, social, and ethical considerations.

Organize and process information and apply decision-making and problem-solving skills in school, real, or simulated workplace situations.

Use decision-making skills to select a CAM focus of study.

Communication

Select and use appropriate communication strategies in family, school, community, and workplace settings.

Demonstrate effective communication skills to give and receive information in school, community, and workplace.

Use technology to process, create, and communicate information in multi-media presentations.

Use interpersonal communications skills to receive verbal and non-verbal messages, recognizing personal and cultural differences.

Read technical materials for information and application.

Write in a variety of modes (e.g., narrative, expository, imaginative, persuasive) and forms (e.g., essays, letters or business communications, research papers, technical reports) appropriate to audience and purpose.

Use various communication strategies within life role contexts for such purposes as informing, describing, questioning, and persuading.

Teamwork

Develop and use interpersonal skills that contribute to cooperation and teamwork in working toward common goals in family, school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Demonstrate interpersonal skills required for working cooperatively in teams.

Use individual strengths and interests to accomplish team goals in multiple life role settings.

Understand the issues related to diversity in school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

Demonstrate respect and flexibility in team situations.

Analyze teamwork and propose measures to enhance team effectiveness and achieve common goals.

Employment Foundations

Integrate academic, technical and organizations knowledge and skills to work successfully in family, school, community, and workplace settings.

Demonstrate academic, technical, and organizational knowledge and skills required for successful employment.

Compare and contrast the academic knowledge and technical skills needed for achieving desired personal and career choices.

Analyze laws and organizational rules to understand policies and practices.

Research and report on the impact of technology on personal, educational, and career/life goals.

Demonstrate knowledge and skills basic to maintaining physical and mental health.

Identify and explain an individual’s rights and responsibilities related to health and safety in home, school, and workplace.

Explain the interdependence of the work of a department or section to other departments or sections within an organization.

Demonstrate the ability to work effectively within the school, community, or workplace settings.

Identify reasons and strategies for making changes in the workplace.

Demonstrate how habits and skills (e.g., punctuality, dependability, cooperation, collaboration, dress, and appearance) developed in school are transferable to a variety of settings.

Career Development

Develop skills to assess personal characteristics, interests, abilities, and strengths.

Demonstrate career development skills in planning for post high school experiences.

Select and explain the choice of an endorsement area that reflects personal characteristics, interests, and abilities.

Describe how personal characteristics, interests, and abilities relate to career and life role choices.

Recognize and describe the challenges and conflicts that may arise in the process of simultaneously filling multiple life roles.

Evaluate the relationship between potential career goals and other life role responsibilities.

Use a variety of resources to research, analyze, and explore career options.

Utilize various classification systems for occupations, industries, career interests, and education and training programs in relation to a CAM focus of study.

Describe the relationship between educational achievement and career planning.

Identify local and regional educational, employment, and career options.

Identify factors that have influenced the changing career and life role patterns of women.

Establish tentative personal, educational, and career goals that recognize multiple life role responsibilities.

Describe how continuous changes in the world of work necessitate lifelong learning, frequent retraining, and updating for both employers and employees.

Develop skills in identifying, evaluating, and using a variety of resources for exploring personal, educational, and career choices.

Demonstrate career development skills in planning for post high school experiences.

Re-evaluate the personalized high school plan and revise as needed to meet evolving educational and career goals.

Demonstrate job-seeking skills (e.g., writing resumes, completing applications, and participating in interviews.

CRLS High School

Personal Management

Develop competence in personal management that contributes to fulfilling and balancing responsibilities of multiple life roles (i.e., individual, learner, producer, consumer, family member, citizen).

Exhibit appropriate work ethic and behaviors in school, community, and workplace.

CS.PM.01 Identify tasks that need to be done and initiate action to complete the tasks.

CS.PM.02 Plan, organize, and complete projects and assigned tasks on time, meeting agreed upon standards of quality.

CS.PM.03 Take responsibility for decisions and actions and anticipate consequences of decisions and actions.

CS.PM.04 Maintain regular attendance and be on time.

CS.PM.05 Maintain appropriate interactions with colleagues.

Problem Solving

Develop and use productive and socially responsible approaches for resolving problems in family, school, community, and workplace settings.

Apply decision-making and problem-solving techniques in school, community, and workplace.

CS.PS.01 Identify problems and locate information that may lead to solutions.

CS.PS.02 Identify alternatives to solve problems.

CS.PS.03 Assess the consequences of the alternatives.

CS.PS.04 Select and explain a proposed solution and course of action.

CS.PS.05 Develop a plan to implement the selected course of action.

CS.PS.06 Assess results and take corrective action.

Communication

Select and use appropriate communication strategies in family, school, community, and workplace settings.

Demonstrate effective communication skills to give and receive information in school, community, and workplace.

CS.HS.01 Locate, process, and convey information using traditional and technological tools.

CS.HS.02 Listen attentively and summarize key elements of verbal and non-verbal communication.

CS.HS.03 Give and receive feedback in a positive manner.

CS.HS.04 Read technical/instructional materials for information and apply to specific tasks.

CS.HS.05 Write instructions, technical reports, and business communications clearly and accurately.

CS.HS.06 Speak clearly, accurately, and in a manner appropriate for the intended audience when giving oral instructions, technical reports, and business communications.

Teamwork

Develop and use interpersonal skills that contribute to cooperation and teamwork in working toward common goals in family, school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

CS.TW.01 Identify different types of teams and roles within each type of team; describe why each role is important to effective teamwork.

Understand the issues related to diversity in school, community, and workplace settings.

Demonstrate effective teamwork in school, community, and workplace.

CS.TW.02 Demonstrate skills that improve team effectiveness (e.g., negotiation, compromise, consensus building, conflict management, shared decision-making and goal-setting).

Employment Foundations

Integrate academic, technical and organizations knowledge and skills to work successfully in family, school, community, and workplace settings.

Demonstrate academic, technical, and organizational knowledge and skills required for successful employment.

CS.EF.01 Apply academic knowledge and technical skills in a career context.

CS.EF.02 Select, apply, and maintain tools and technologies appropriate for the workplace.

CS.EF.03 Identify parts of organizations and systems and how they fit together.

CS.EF.04 Describe how work moves through a system.

CS.EF.05 Describe the changing nature of work, workplaces, and work processes on individuals, organizations, and systems.

CS.EF.06 Demonstrate dress, appearance, and personal hygiene appropriate for the work environment and situation.

CS.EF.07 Explain and follow health and safety practices in the work environment.

CS.EF.08 Explain and follow regulatory requirements, security procedures, and ethical practices.

Career Development

Develop skills to assess personal characteristics, interests, abilities, and strengths.

Demonstrate career development skills in planning for post high school experiences.

CS.CD.01 Assess personal characteristics related to educational and career goals.

CS.CD.02 Research and analyze career and educational information.

CS.CD.03 Develop and discuss a current plan designed to achieve personal, educational, and career goals.

Develop skills in identifying, evaluating, and using a variety of resources for exploring personal, educational, and career choices.

Demonstrate career development skills in planning for post high school experiences.

CS.CD.04 Monitor and evaluate educational and career goals.

CS.CD.05 Demonstrate job-seeking skills (e.g., writing resumes, completing applications, and participating in interviews).

Section 5

Oregon State Standards

Educational Technology

ONREP

Oregon Natural Resources Education Program

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Oregon State Standards, CCSS, and NGSS

Educational Technology

Educational Technology (All Grades)

Educational technology is the application of technology to the teaching and learning process. In order for students to be prepared for the 21st Century, Oregon schools need to provide opportunities for students to use technology skills that are applied in a variety of courses, subjects, experiences and settings. A technologically literate student accesses and acquires knowledge, exchanges ideas and opinions, solves problems, and creates, innovates and expresses themselves through the skillful use of a variety of technologies.

ET.1 Creativity and Innovation: Students demonstrate creative thinking and problem solving skills to develop innovative products and processes using (digital) technology.

ET.1.A Apply existing knowledge to forecast possibilities and generate new ideas, products or processes.

ET.1.B Create original works as a means of personal or group expression.

ET.1.C Develop or apply models and simulations to explore complex systems, issues and trends.

ET.2 Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, across the global community, to support individual learning and contribute to the learning of others.

ET.2.A Interact and collaborate with peers, experts, or others employing a variety of digital environments and media.

ET.2.B Effectively communicate and publish to multiple audiences using a variety of media and formats.

ET.2.C Engage with learners from other cultures to develop cultural understanding and global awareness.

ET.2.D Contribute to project teams. Produce original works or solve problems in a team setting.

ET.3 Research and Information Fluency: Students select and apply digital tools to gather, evaluate, validate, and use information.

ET.3.A Plan strategies to guide inquiry.

ET.3.B Locate, organize and use information ethically from a variety of sources and media.

Text in grey boxes denotes technology standards. Text in plain font denotes indicators related to standards.

ET.3.C Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

ET.3.D Analyze, evaluate, and summarize information or data and report results.

ET.4 Critical Thinking, Problem Solving and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

ET.4.A Identify and define authentic problems and significant questions for investigation.

ET.4.B Plan and manage activities to develop a solution or complete a project.

ET.4.C Collect and analyze data to identify solutions and make informed decisions.

ET.4.D Use multiple processes and diverse perspectives to explore alternative solutions.

ET.5 Digital Citizenship: Students understand human, cultural, and societal issues related to digital technology and practice legal, ethical, and responsible behavior.

ET.5.A Advocate and practice safe, legal, and responsible use of information and digital technology.

ET.5.B Model and practice a positive attitude toward using digital technology that supports collaboration, learning, and productivity.

ET.5.C Demonstrate personal responsibility for lifelong learning.

ET.6 Technology Operations and Concepts: Students utilize technology concepts and tools to learn.

ET.6.A Select, use, and troubleshoot tools efficiently.

ET.6.B Transfer current knowledge to learning of new technologies.

Text in grey boxes denotes technology standards. Text in plain font denotes indicators related to standards.

Section 6

Oregon State Standards

Physical Education

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Oregon State Standards, CCSS, and NGSS

Physical Education

Third Grade

Benchmark 1 (Grades K-3) physical education students work on the basic skills of moving, using equipment and varying the manner in which the skills are performed in relationship to changing conditions and expectations. Students achieve mature form in the less complex skills (e.g., underhand throw) and progress toward achieving mature form in the more complex skills (e.g., foot dribble). They also work on safe practices, physical education class rules and procedures.

Expressive and Efficient Moving

Demonstrate knowledge of a variety of motor skills.

PE.03.EE.01 Demonstrate mature form of basic locomotor patterns: run, gallop, slide, horizontal jump, hop, leap, and skip, starting and stopping on command and in control.

PE.03.EE.02 Demonstrate critical elements in manipulative skills: throw, catch, kick, and strike.

PE.03.EE.03 Balance, demonstrating momentary stillness, in symmetrical and asymmetrical shapes on a variety of body parts.

PE.03.EE.04 Demonstrate three different step patterns and combinations of movements into repeatable sequences.

Understand and participate in a variety of physical and recreational activities available in the school and community.

No standards currently exist for this CCG

Understand and apply movement concepts.

No standards currently exist for this CCG

Understand and apply physical education vocabulary as it relates to movement concepts.

No standards currently exist for this CCG

Understand rules and strategies for a variety of physical activities.

No standards currently exist for this CCG

Fitness for Lifetime

Demonstrate knowledge of a physically active lifestyle.

PE.03.FL.01 Identify changes in his/her body during moderate to vigorous exercise.

Understand the meaning of physical fitness and how personal fitness can be improved and maintained using a health-related fitness assessment as one tool for measuring.

No standards currently exist for this CCG

Self- Management and Social Behavior

Understand appropriate and positive behavior management (social skills) and respect for all individual differences, including gender, ethnicity, and physical ability during physical activity.

PE.03.SM.01 Identify rules, procedures, and etiquette in a specified physical activity.

PE.03.SM.02 Identify positive ways to resolve conflict.

Understand and apply safety in movement activities.

No standards currently exist for this CCG

Understand that history and culture influence games, sports, play, and dance.

No standards currently exist for this CCG

Fifth Grade

Benchmark 2 (Grades 4-5) physical education students continue to build on achieving mature form of more complex skills (e.g., hand dribble, throw). Students begin to engage in physical activities specifically related to each component of physical fitness (cardio-respiratory endurance, muscular strength and endurance, flexibility and body composition), complete standardized fitness testing comprised of these components and with teacher assistance interpret the results. Students become capable of monitoring their own activity and use performance feedback to increase their understanding of a skill as well as to improve performance.

Expressive and Efficient Moving

Demonstrate knowledge of a variety of motor skills.

PE.05.EE.01 Demonstrate the use of a foot dribble (R/L foot), hand dribble (R/L hand), strike, throw, catch, and volley with a partner.

PE.05.EE.02 Perform one dance or rhythmic activity to music.

Understand and participate in a variety of physical and recreational activities available in the school and community.

No standards currently exist for this CCG

Understand and apply movement concepts.

PE.05.EE.03 Through feedback and practice, demonstrate improvement in performance of a new motor skill.

Understand and apply physical education vocabulary as it relates to movement concepts.

No standards currently exist for this CCG

Understand rules and strategies for a variety of physical activities.

PE.05.EE.04 Use basic offensive and defensive roles in physical activities, or games, or sports.

PE.05.EE.05 Identify rules and procedures in specified physical activities.

Fitness for Lifetime

Demonstrate knowledge of a physically active lifestyle.

PE.05.FL.01 Identify changes in his/her body before, during and after moderate to vigorous exercise (e.g., perspiration, increased heart and breathing rates).

Understand the meaning of physical fitness and how personal fitness can be improved and maintained using a health-related fitness assessment as one tool for measuring.

PE.05.FL.02 Identify and assess the health-related components of fitness.

Self- Management and Social Behavior

Understand appropriate and positive behavior management (social skills) and respect for all individual differences, including gender, ethnicity, and physical ability during physical activity.

PE.05.SM.01 Explain and demonstrate safety, rules, procedures, and etiquette to be followed during participation in physical activities.

Understand and apply safety in movement activities.

No standards currently exist for this CCG

Understand that history and culture influence games, sports, play, and dance.

No standards currently exist for this CCG

Eighth Grade

Benchmark 3 (Grades 6-8) students use the mature forms of the basic skills in more specialized sports, dance and activities. They identify principles of practice and conditioning and know when, why and how to use strategies within game play. Additionally, students know the components of fitness and how these relate to their overall fitness status. They assess their personal fitness status on each component and use this information in the development of individualized physical fitness goals. Moving from merely identifying and following rules, procedures, safe practices, ethical behavior, students start reflecting upon their role in physical activity setting and the benefits of physical activity. They make appropriate decisions to resolve conflict arising from the influence of peers and practiced appropriate problem-solving techniques.

Expressive and Efficient Moving

Demonstrate knowledge of a variety of motor skills.

PE.08.EE.01 Demonstrate movement principles (mechanics, force, speed) in performing skills related to a team activity and an individual or partner activity.

PE.08.EE.02 Execute a floor exercise, jump rope, or manipulative routine with intentional changes in direction, speed, and flow.

PE.08.EE.03 Demonstrate one of the following rhythmic activities: folk, square, social, creative dance, aerobic.

Understand and participate in a variety of physical and recreational activities available in the school and community.

No standards currently exist for this CCG

Understand and apply movement concepts.

PE.08.EE.04 Describe and apply principles of training, conditioning, and practice for specific physical activities.

PE.08.EE.05 Detect and correct errors of a critical element of movement.

Understand and apply physical education vocabulary as it relates to movement concepts.

No standards currently exist for this CCG

Understand rules and strategies for a variety of physical activities.

PE.08.EE.06 Demonstrate basic strategies specific to one team activity and one dual or individual activity.

PE.08.EE.07 Demonstrate an understanding of the rules to be followed during participation in specified physical activities.

Fitness for Lifetime

Demonstrate knowledge of a physically active lifestyle.

PE.08.FL.01 Develop personal activity goals and describe benefits that result from regular participation in physical education.

PE.08.FL.02 Analyze and categorize physical activities according to potential fitness benefits.

Understand the meaning of physical fitness and how personal fitness can be improved and maintained using a health-related fitness assessment as one tool for measuring.

PE.08.FL.03 Correctly interpret results of physical fitness assessments and use them to develop a written fitness program.

PE.08.FL.04 Identify the principles of fitness training using the FITT (Frequency, Intensity, Time and Type) model.

Self- Management and Social Behavior

Understand appropriate and positive behavior management (social skills) and respect for all individual differences, including gender, ethnicity, and physical ability during physical activity.

PE.08.SM.01 Apply rules, procedures, and etiquette that are safe and effective for specific activities/situations.

PE.08.SM.02 Identify the elements of socially acceptable conflict resolution and sportsmanship.

Understand and apply safety in movement activities.

No standards currently exist for this CCG

Understand that history and culture influence games, sports, play, and dance.

No standards currently exist for this CCG

High School

High school students possess motor skills and movement patterns allowing them to perform a variety of physical activities and to achieve a degree of success making activities enjoyable. In addition, they show the ability to perform basic and advanced skills and tactics to participate in at least one activity from each of three major categories. Students demonstrate responsibility for their own health-related fitness status and are largely independent in assessing their personal fitness status, and they can interpret information from fitness tests and use this information to plan and design their own program to achieve and maintain personal fitness goals. Students demonstrate leadership by holding themselves and others responsible for safe practices, rules, procedures, and etiquette in all physical activity.

Expressive and Efficient Moving

Demonstrate knowledge of a variety of motor skills.

PE.HS.EE.01 Demonstrate competency (basic skills) in complex versions of three or more of the following categories of movement forms and more advanced skills in one or more movement forms. (One activity counts in one category)
Individual activities
Dual activities
Aerobic/cardio-respiratory lifetime activities
Outdoor pursuits
Dance, self-defense, yoga, martial arts
Team sports
Strength training & conditioning
Aquatics

Understand and participate in a variety of physical and recreational activities available in the school and community.

No standards currently exist for this CCG

Understand and apply movement concepts.

PE.HS.EE.02 Utilize the following components to critique an activity: skills and strategies, use of feedback, positive and negative aspects of personal performance, appropriate practice and conditioning procedures.

Understand and apply physical education vocabulary as it relates to movement concepts.

No standards currently exist for this CCG

Understand rules and strategies for a variety of physical activities.

PE.HS.EE.03 Communicate to others basic strategies specific to one team activity and one dual or individual activity.

PE.HS.EE.04 Demonstrate rules and strategies in complex versions of at least two different categories of the following movement forms:
Individual activities
Dual activities
Aerobic/cardio-respiratory lifetime activities
Outdoor pursuits
Dance, self-defense, yoga, martial arts
Team sports
Strength training & conditioning
Aquatics

Fitness for Lifetime

Demonstrate knowledge of a physically active lifestyle.

PE.HS.FL.01 Participate in physical activities and evaluate personal factors that impact participation.

PE.HS.FL.02 Through physical activity, understand ways in which personal characteristics, performance styles, and activity preferences will change over the life span.

Understand the meaning of physical fitness and how personal fitness can be improved and maintained using a health-related fitness assessment as one tool for measuring.

PE.HS.FL.03 Assess and analyze personal health-related fitness status.

PE.HS.FL.04 Independently design a written personal fitness and activity program which incorporates related physical fitness components and principles (overload, progression, specificity, and individuality).

Self- Management and Social Behavior

Understand appropriate and positive behavior management (social skills) and respect for all individual differences, including gender, ethnicity, and physical ability during physical activity.

PE.HS.SM.01 Analyze and apply rules, procedures, and etiquette that are safe and effective for specific activities/situations.

PE.HS.SM.02 Apply conflict resolution strategies in appropriate ways and analyze potential consequences when confronted with unsportsman-like behavior.

Understand and apply safety in movement activities.

No standards currently exist for this CCG

Understand that history and culture influence games, sports, play, and dance.

No standards currently exist for this CCG

Section 7

Oregon State Standards

Second Language

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Oregon State Standards, CCSS, and NGSS

Second Language

Proficiency Stage 1

Students at Proficiency Stage 1 (approximates ACTFL Novice-Low) can understand phrases, words, everyday expressions and simple statements on familiar topics. Students communicate using memorized/rehearsed phrases, sentences and questions. Students rely on contextual and visual cues. Through language study, they will begin to compare the language and culture studied with their own.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital or live presentations).

SL.PS1.IL.01 Demonstrate understanding of some words/signs, (phrases, everyday expressions and simple statements on a limited range of familiar topics in everyday situations).

Recognize vocabulary related to familiar topics

Understand a short series of simple directions

Interpretive Mode: Reading (ASL Literary materials exist in video and digital forms)

Students can comprehend print and digital materials from a variety of authentic and other sources (e.g., websites, newspapers, letters, notes, applications, menus).

SL.PS1.IR.01 Identify some common words, symbols, phrases and cognates from familiar material.

Know letters or symbols of the target language

Combine symbols to form words

Understand common cognates, borrowed and high-frequency words and expressions from familiar material

Use contextual and visual cues

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

Students can understand and respond to what others say/sign.

SL.PS1.IS.01 Use memorized words/signs, phrases and expressions in everyday situations.

Provide basic personal information

Answer predictable questions with memorized responses

Material in *italics* identifies Supporting Functions.

Use common greetings and farewells

Presentational Mode: Writing

Students can write ideas and information for an audience.

SL.PS1.PW.01 Write symbols/characters, basic high-frequency words and memorized phrases.

Make lists of familiar objects and vocabulary

Spell familiar words using the target language alphabet

Express simple ideas in short memorized phrases

Presentational Mode: Speaking

Students can speak to an audience about basic ideas and information.

SL.PS1.PS.01 Present basic information using common words, phrases and everyday expressions.

Present basic material in an organized manner

Use vocabulary sufficient to get meaning across

Rely on gestures or visuals to present ideas

Proficiency Stage 2

Students at Proficiency Stage 2 (approximates ACTFL Novice-Mid) can understand simple ideas on everyday topics and identify some information embedded in familiar contexts. Student communication includes basic material, short messages and the expression of simple ideas. Students use memorized/rehearsed phrases, sentences and questions. Through language study, they will make connections with other content areas, compare the language and culture studied with their own, and participate in local and global communities.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital, or live presentations).

SL.PS2.IL.01 Demonstrate understanding of main ideas from short, simple conversations, narratives and presentations on a limited range of familiar topics in everyday situations.

Recognize differences between formal and informal language

Listen to and demonstrate understanding of some common cognates, borrowed and high-frequency words and expressions from familiar material

Listen to and demonstrate general understanding of short, predictable speech

Demonstrate ability to extract discrete information from simple communications

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Material in *italics* identifies Supporting Functions.

Use contextual and visual cues

Interpretive Mode: Reading (ASL Literary materials exist in video and digital formats)

Students can comprehend print and digital materials from a variety of authentic and other sources (e.g., websites, newspapers, letters, notes, applications, menus).

SL.PS2.IR.01 Obtain information from simple text, often using contextual cues.

Read and demonstrate understanding of some common cognates, borrowed and high-frequency words and expressions from familiar material

Demonstrate understanding of short, predictable text

Demonstrate ability to extract discrete information from simple texts (e.g. posters, timetables, ads)

Use contextual and visual cues

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

Students can understand and respond to what others say/sign.

SL.PS2.IS.01 Use memorized phrases, sentences and questions to express ideas or obtain information on a limited range of topics in everyday situations.

Provide basic personal information

Give simple descriptions

Express likes and dislikes

Provide information about everyday activities

Answer predictable questions with memorized/rehearsed responses

Presentational Mode: Writing

Students can write ideas and communicate information for an audience.

SL.PS2.PW.01 Write from memory some high-frequency words, phrases and simple sentences and questions.

Present basic material in an organized manner

Use vocabulary sufficient to get meaning across

Use visuals to enhance communication and maintain audience attention

Presentational Mode: Speaking

Students can speak to an audience about ideas and information.

Material in *italics* identifies Supporting Functions.

SL.PS2.PS.01 Speak to an audience using memorized phrases and simple sentences.

Present basic material in an organized manner

Use vocabulary sufficient to get meaning across

Use some gestures or visuals to enhance communication

Attempt to maintain audience attention

Recite poems, rhymes, role-plays etc.

Proficiency Stage 3

Students at Proficiency Stage 3 (approximates ACTFL Novice-High) can identify main ideas and simple information on familiar topics. Students communicate using some original sentences and questions, relying on memorized/rehearsed material, to obtain and provide information. They participate in very simple conversations and get basic needs met in the target culture. Through language study, they will make connections with other content areas, compare the language and culture studied with their own, and participate in local and global communities.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital or live presentations).

SL.PS3.IL.01 Demonstrate understanding of main ideas and some details from simple conversations, narratives and presentations on familiar topics in everyday situations.

Identify main ideas and some significant details on familiar topics

Identify information embedded in familiar contexts and connected to core academic content

Recognize expressions used in certain circumstances

Interpretive Mode: Reading (ASL Literary materials exist in video and digital formats)

Students can comprehend print and digital materials from a variety of authentic and other sources (e.g. websites, newspapers, letters, notes, applications, menus, etc.).

SL.PS3.IR.01 Identify main ideas and some details from short simple texts.

Identify main ideas and some significant details on familiar topics

Identify information embedded in familiar contexts and connected to core academic content

Determine meanings by using contextual cues

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

Students can understand and respond to what others say/sign.

Material in *italics* identifies Supporting Functions.

SL.PS3.IS.01 Use memorized and some original sentences and questions to perform simple communicative tasks in everyday situations.

SL.PS3.IS.02 Participate in simple conversations on a limited range of topics.

SL.PS3.IS.03 Conduct simple rehearsed transactions necessary for survival in the target culture.

Give simple descriptions

Express simple opinions

Give basic directions and commands

Use numbers in common situations, such as measurement, time and prices

Extend/accept invitations and make plans

Make purchases and acquire basic services

Presentational Mode: Writing

Students can write to communicate information and ideas to an audience.

SL.PS3.PW.01 Write some simple original sentences and questions relying on memorized/familiar material.

Present material in an organized manner

Write short messages, postcards, simple descriptions and simple narrations

Provide information on applications and common documents

Presentational Mode: Speaking

Students can speak to communicate information and ideas to an audience.

SL.PS3.PS.01 Present material in a clear and organized manner using simple sentences and some strings of sentences.

Present material in an organized manner

Leave short phone messages, make public service announcements, etc.

Recite poems and rhymes, perform songs, etc.

Use gestures or visuals to enhance communication

Maintain audience attention

Proficiency Stage 4

Students at Proficiency Stage 4 (approximates ACTFL Intermediate-Low) can identify main ideas and some supporting information on familiar topics. Students communicate using rehearsed and original sentences and questions, to exchange ideas and to obtain and provide information. This includes participating in simple conversations and getting some needs met in the target culture. Through language study, they will make connections with other content areas, compare the language and culture studied with their own, and participate in local and global communities.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital or live presentations).

SL.PS4.IL.01 Identify main ideas and some supporting details in simple conversations and presentations on familiar topics in everyday situations.

Identify main ideas and significant details on familiar topics

Identify the most significant ideas embedded in familiar contexts and connected to core academic content

Recognize high-frequency idiomatic expressions

Interpretive Mode: Reading (ASL Literary materials exist in video and digital formats)

Students can comprehend print and digital materials from a variety of authentic and other sources (e.g., websites, newspapers, letters, notes, applications, menus, etc.).

SL.PS4.IR.01 Identify main ideas and supporting details from simple texts.

Read short, authentic or teacher-generated text (e.g., poems, short literary text, periodicals)

Identify main ideas and supporting details in familiar contexts and/or connected to core academic content

Provide a sequence of main events from text

Draw inferences and make simple predictions and conclusions

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

Students can understand and respond to what others say/sign.

SL.PS4.IS.01 Create simple sentences and questions to exchange ideas and to obtain and provide information.

SL.PS4.IS.02 Participate in simple conversations on a range of familiar topics in everyday situations.

SL.PS4.IS.03 Conduct predictable transactions necessary for survival in the typical daily life of the target culture.

Describe with some supporting details

State feelings and emotions

Give directions

Make suggestions

Material in *italics* identifies Supporting Functions.

Express needs, opinions and preferences

Make arrangements and plans

Report events in present time

Presentational Mode: Writing

Students can write to communicate information and ideas to an audience.

SL.PS4.PW.01 Create/Compose simple original sentences and questions on very familiar topics.

Convey information using simple original sentences and strings of sentences

Present material in an organized manner

Use vocabulary that is sufficient to provide information and limited explanation

Write messages, short letters, simple descriptions and simple narrations

Make attempts to acknowledge/engage audience

Presentational Mode: Speaking

Students can speak to communicate information and ideas to an audience.

SL.PS4.PS.01 Speak to an audience to present material using strings of sentences and connected discourse.

Present material in an organized manner

Convey information using simple original sentences and strings of sentences

Use vocabulary that is sufficient to provide information and limited explanation

Begin to make choices of phrase or content to maintain the attention of the audience

Proficiency Stage 5

Students at Proficiency Stage 5 (approximates ACTFL Intermediate-Mid) can identify main ideas and supporting information from a wider range of sources. Students communicate using original language, questions and strings of sentences to obtain and provide information. This includes participating in conversations and getting needs met in the target culture. At this stage students begin to communicate in different time frames. Through language study, they will make connections with other content areas, compare the language and culture studied with their own, and participate in local and global communities.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital or live presentations).

SL.PS5.IL.01 Demonstrate understanding of ideas and supporting details from longer and somewhat more complex conversations, presentations and narratives on topics from everyday life.

Material in *italics* identifies Supporting Functions.

SL.PS5.IL.02 Infer the meaning of some unfamiliar words and phrases when used in familiar contexts.

Identify main ideas and some supporting details on familiar and some unfamiliar topics

Identify significant ideas embedded in familiar contexts and connected to academic content

Recognize and understand high-frequency idiomatic expressions

Understand the use of verbal and non-verbal gestures, intonation etc., in contexts from the target culture

Interpretive Mode: Reading (ASL Literary materials exist in video and digital formats)

> Students can comprehend print and digital materials from a variety of authentic and other sources (e.g., websites, newspapers, letters, notes, articles, short works of fiction).

SL.PS5.IR.01 Demonstrate understanding of ideas and supporting details from longer and somewhat more complex written texts on topics from everyday life.

SL.PS5.IR.02 Draw conclusions and make inferences, supporting them with information from the text.

Read authentic texts with more abstract themes and ideas

Identify main ideas and some supporting details on familiar and some unfamiliar topics

Identify significant ideas embedded in familiar contexts and connected to core academic content

Recognize and understand high-frequency idiomatic expressions

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

> Students can understand and respond to what others say/sign.

SL.PS5.IS.01 Create language, questions and strings of sentences to exchange ideas and to provide and obtain information.

SL.PS5.IS.02 Participate in a more extended conversation using a variety of related questions and responses on familiar topics.

SL.PS5.IS.03 Conduct a variety of transactions necessary for survival in the typical daily life of the target culture.

Exchange personal feelings, thoughts, opinions and preferences

Express needs and wants

Ask for and give permission

Request, suggest and make arrangements or plans

Extend, accept or decline invitations

Give multi-step directions for a simple task

Material in *italics* identifies Supporting Functions.

Describe events, things and people

Generate varied questions to extend or enrich conversation

Demonstrate control of present time; partial control of another timeframe (future or past time)

Describe events, things and people and make simple comparisons

Presentational Mode: Writing

Students can write to communicate information and ideas to an audience.

SL.PS5.PW.01 Create/Compose original language using questions and strings of sentences on familiar and some unfamiliar topics.

SL.PS5.PW.02 Make attempts to maintain the attention of the audience.

Write short letters, descriptions, explanations and simple narrations

Express needs, make requests

Express opinions and preferences

Presentational Mode: Speaking

Students can speak to communicate information and ideas to an audience.

SL.PS5.PS.01 Present organized material in a sustained, connected manner using somewhat more complex original language.

SL.PS5.PS.02 Make attempts to maintain the attention of the audience.

Convey information using strings of sentences, with some connected sentence-level discourse

Use vocabulary sufficient to provide information and limited explanation

Make choices of phrase or content to maintain the attention of the audience

Recite poems, songs, dramatic pieces from the target language/culture

Proficiency Stage 6

Students at Proficiency Stage 6 (approximates ACTFL Intermediate-High) can identify main ideas and supporting information from more complicated texts and presentations. Students communicate using original language to obtain and provide information. This includes participating in conversations and handling increasingly complicated situations in the target culture. At his stage students can communicate in a variety of time frames and communicate with others about topics of both personal and social interest. Through language study, they will make connections with other content areas, compare the language and culture studied with their own, and participate in local and global communities.

Interpretive Mode: Listening (Corresponds to ASL Receptive Skills)

Material in *italics* identifies Supporting Functions.

Students can comprehend verbal or signed language from authentic and other sources (e.g., TV, radio, video, digital or live presentations).

SL.PS6.IL.01 Demonstrate understanding of ideas and supporting details from longer and more complex conversations, presentations and narratives on topics from everyday life and social issues.

SL.PS6.IL.02 Infer the meaning of unfamiliar words and phrases when used in familiar contexts.

Identify main ideas and supporting details on familiar and some unfamiliar topics

Identify significant ideas embedded in familiar and unfamiliar contexts and connected to core academic content

Synthesize information from oral or signed presentations

Recognize and understand high-frequency idiomatic expressions

Understand the use of verbal and non-verbal gestures, intonation etc., in contexts from the target culture

Infer and interpret the speaker's intent

Interpretive Mode: Reading (ASL Literary materials exist in video and digital formats)

Students can comprehend print and digital materials from a variety of authentic and other sources (e.g., websites, newspapers, letters, notes, articles, short works of fiction).

SL.PS6.IR.01 Demonstrate understanding of ideas and supporting details from longer and more-complex written texts on topics from everyday life and social issues.

SL.PS6.IR.02 Draw conclusions and make inferences, supporting them with information from the text.

Read authentic texts with more abstract themes and ideas

Identify main ideas and supporting details on familiar and some unfamiliar topics

Identify significant ideas embedded in familiar and unfamiliar contexts connected to core academic content

Recognize and understand high-frequency idiomatic expressions

Synthesize information from a variety of texts

Infer and interpret the writer's intent

Interpersonal Mode: Speaking (Corresponds to ASL Expressive Skills)

Students can understand and respond to what others say/sign.

SL.PS6.IS.01 Create language, questions and connected discourse to exchange ideas and to provide and obtain information.

Material in *italics* identifies Supporting Functions.

SL.PS6.IS.02 Initiate, sustain and close an extended conversation using a series of related questions and responses on a wider variety of topics.

SL.PS6.IS.03 Narrate and describe events that take place in various time frames.

SL.PS6.IS.04 Conduct a variety of transactions necessary for survival in the typical daily life of the target culture, which may include a complication.

Exchange personal feelings, thoughts, opinions and preferences

Express needs and wants

Ask for and give permission

Request, suggest and make arrangements or plans

Extend, accept or decline invitations

Give multi-step directions for a simple task

Generate varied questions to extend or enrich conversation

Demonstrate control of present time; partial control of future and past time

Describe events, things and people and make simple comparisons

Ask for and provide clarification and explanation

Use communication strategies to make oneself understood

Presentational Mode: Writing

Students can write to communicate information and ideas to an audience.

SL.PS6.PW.01 Present organized material in a sustained, connected manner using more complex original language and a variety of time frames.

SL.PS6.PW.02 Narrate and describe across a wide-range of topics of personal and social interest.

SL.PS6.PW.03 Make attempts to engage and maintain the attention of the intended audience.

Write letters, descriptions, explanations, articles and narrations

Vocabulary is sufficient to provide information and explanation

Express needs, make requests and suggestions

Express and support opinions and preferences

Compose stories, short plays, poems etc.

Presentational Mode: Speaking

Students can speak to communicate information and ideas to an audience.

SL.PS6.PS.01 Present organized material in a sustained, connected manner using more complex original language and a variety of time frames.

Material in *italics* identifies Supporting Functions.

SL.PS6.PS.02 Narrate and describe across a wide-range of topics of personal and social interest.

SL.PS6.PS.03 Make attempts to engage and maintain the attention of the intended audience.

Convey information using connected sentence-level discourse with some evidence of logical sequence and organization

Vocabulary is sufficient to provide information and explanation

Express needs, make requests and suggestions

Express and support opinions and preferences

Recite poems, songs, dramatic pieces from the target language/culture

Material in *italics* identifies Supporting Functions.

Section 8

Oregon State Standards

Social Studies

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Social Sciences (2011)

Kindergarten

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues.

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

K.1. Compare children and families of today to those of the past.

K.2. Identify celebrations, commemorations, and holidays as a way of remembering and honoring people, events, and heritage.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

K.3. Distinguish between past and present.

K.4. Compare and contrast the student’s own environment with the past.

K.5. Use sense of time for planning.

K.6. Create and explain a simple timeline of events.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

K.7. Identify and compare and contrast pictures, maps and globes.

K.8. Describe roles of self and family members.

K.9. Locate, identify, and describe places of importance to self, family, and school.

K.10. Explain how people can care for the environment.

K.11. Use terms related to location, direction, and distance (e.g., over/under, here/there, left/right, above/below, forward/backward, between).

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

K.12. Explain why rules are needed and how rules reduce conflict and promote fairness.

K.13. Use and identify respectful dialog, taking turns, and explain how rules are different in different settings.

K.14. Distinguish between democratic methods and decisions made by authority.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

K.15. Identify various forms of money and explain how money is used.

K.16. Give examples of different jobs performed in neighborhoods.

K.17. Identify examples of ownership of different items, recognizing the difference between private and public ownership, and the need for sharing.

K.18. Explain how jobs provide income.

K.19. Distinguish between wants and needs.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

K.20. Compare and contrast past and present events or practices.

First Grade

It is essential that these standards be addressed in contexts that promote Social Science

Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues.

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

1.1. Describe how people live in the community.

1.2. Compare the ways people lived in the community in the past with the way they live in the present.

1.3. Identify American songs and symbols.

1.4. Identify people and events observed in national celebrations and holidays.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

1.5. Use terms related to time to sequentially order events that have occurred.

1.6. Describe how clocks and calendars are used to measure time.

1.7. Develop and analyze a simple timeline of important events.

1.8. Identify and compare historical fact and fiction in folktales and legends.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

1.9. Describe ways people celebrate their diverse cultural heritages in the community.

1.10. Locate and identify important places in the community (school, library, fire department, etc.).

1.11. Explain how seasonal changes influence activities in school and community.

1.12. Give examples of local natural resources and describe how people use them.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

1.13. Describe the responsibilities of leaders.

1.14. Describe the responsibilities of team members.

1.15. Demonstrate the ability to be both a leader and team member.

1.16. Identify the United States and Oregon flags and other symbols.

1.17. Identify and describe significant holidays.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one’s financial resources effectively for lifetime financial security.

1.18. Explain how personal saving and spending can be used to meet short-term financial goals.

1.19. Identify sources of income (e.g., gifts, borrowing, allowance, work wages).

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

1.20. Identify cause-and-effect relationships.

1.21. Identify an issue or problem that can be studied.

Second Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues.

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

2.1. Identify individuals who had an impact on the local community and explain how people and events of the past influence the present.

2.2. Identify when the local community was established and identify its founders and early settlers and recognizing continuity and change in local and regional communities over time.

2.3. Identify and describe community celebrations, symbols and traditions and explain why they are important to some people.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

2.4. Differentiate between events that happened in the recent and distant past.

2.5. Develop a timeline of important events in the history of the community.

2.6. Identify important school days, holidays, and community events on a calendar.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

2.7. Use basic information on maps and other geographic tools to locate and identify physical and human features of the community.

2.8. Identify relative location of school and community in the state and nation and the world.

2.9. Describe physical and human characteristics of the community.

2.10. Use and apply cardinal directions; locate and identify local physical features on maps (e.g., oceans, cities, continents).

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

2.11. Participate in rule setting and monitoring activities considering multiple points of view.

2.12. Identify services provided by local government.

2.13. Evaluate how individuals, groups, and communities manage conflict and promote justice.

2.14. Give examples of and identify appropriate and inappropriate use of power and the consequences.

2.15. Identify local leaders and their functions.

2.16. Identify ways students can have an impact in their local community.

Economics/Financial Literacy

> Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

2.17. Explain various methods of saving and how saving can help reach financial goals.

2.18. Identify local businesses and the goods and services they produce.

Social Science Analysis

> Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

2.19. Describe the connection between two or more current or historical events.

2.20. Compare and contrast past and present situations, people, and events in neighborhoods and communities.

2.21. Evaluate information relating to an issue or problem.

Third Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): Oregon Geography and Local/Regional History

Historical Knowledge

> Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

3.1. Describe how significant people, events and developments have shaped their own community and region.

3.2. Compare and contrast the history of their own community to other communities in the region.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

3.3. Apply research skills and technologies to gather information about the past in the region.

3.4. Describe local communities and regions past and present.

3.5. Explain how some sources are more useful for answering historical questions than others.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

3.6. Identify hemispheres, continents and oceans using globes and maps.

3.7. Use a simple grid system, symbols, and other information to locate the physical and political features of places on maps and globes.

3.8. Identify links of land, regions, river systems, interstate highways between Oregon and other states.

3.9. Describe physical and human characteristics of tribal regions in Oregon and North America.

3.10. Identify and compare physical features of Oregon and other Northwestern states.

3.11. Explain the influence of humans (traders, immigrants, indigenous, current residents) on Oregon's and the Northwest's physical systems.

3.12. Identify and analyze Oregon's natural resources and describe how people in Oregon and other parts of the world use them.

3.13. Identify how people have adapted to and have changed the physical geography of the community.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

3.14. Describe how different levels of government provide services and protect citizens.

3.15. Describe the responsibilities of citizens in their community and state.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

3.16. Describe the relationship between producers and consumers.

3.17. Explain the issue of scarcity to personal, community, regional, and world resources.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

3.18. Use a variety of historical sources including artifacts, pictures and documents to identify factual evidence.

3.19. Identify and compare different ways of looking at an event, issue, or problem.

3.20. Identify how people or other living things might be affected by an event, issue, or problem.

Fourth Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): Oregon History

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

4.1. Identify and describe historic Native American Indian groups that lived in Oregon prior to contact with Europeans and at the time of early European exploration, including ways these groups adapted to and interacted with the physical environment.

4.2. Explain how key individuals and events influenced the early growth and changes in Oregon.

4.3. Give examples of changes in Oregon's agricultural, industrial, political, and business development over time.

4.4. Identify the 9 federally recognized Oregon tribes and their aboriginal boundaries.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

4.5. Distinguish between fact and fiction in historical accounts by comparing documentary sources on historical figures and events with fictional characters and events in stories.

4.6. Create and evaluate timelines that show relationships among people, events, and movements in Oregon history.

4.7. Use primary and secondary sources to create or describe a narrative about events in Oregon history.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

4.8. Use geographical tools (e.g., maps, GIS, Google Earth) to identify absolute and relative locations and physical characteristics of places in Oregon.

4.9. Explain the influence of Oregon and the Northwest's physical systems on humans, including Native Americans.

4.10. Compare and contrast varying patterns of settlements in Oregon, past and present, and consider future trends.

4.11. Identify conflicts involving use of land, natural resources, economy, and competition for scarce resources, different political views, boundary disputes, and cultural differences within Oregon and between different geographical areas.

4.12. Explain how people in Oregon have modified their environment and how the environment has influenced people's lives.

4.13. Describe how technological developments, societal decisions, and personal practices influence Oregon's sustainability (dams, wind turbines, etc.).

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

4.14. Explain the organization and functions of Oregon government.

4.15. Describe and evaluate how historical Oregon governments affected groups within the state (citizens, foreigners, women, class systems, minority groups, tribes).

4.16. Explain the process of Oregon statehood.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

6.17. Analyze different buying choices and their opportunity costs while demonstrating the difference between needs and wants.

4.18. Identify key industries of Oregon.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

4.19. Compare eyewitness and secondhand accounts of an event.

4.20. Describe the sequence of events in given current and historical accounts.

4.21. Analyze historical accounts related to Oregon to understand cause-and-effect.

Fifth Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): U.S. History 1492-1786

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

1.1. Identify and compare historical Native American groups and settlements that existed in North America prior to contact with European exploration in the late fifteenth and sixteenth centuries.

5.2. Locate and examine accounts of early Spanish, French and British explorations of North America noting major land and water routes, reasons for exploration and the location and impact of exploration and settlement.

5.3. Explain the religious, political, and economic reasons for movement of people from Europe to the Americas and describe instances of both cooperation and conflict between Native American Indians and European settlers.

5.4. Identify and locate the 13 British colonies that became the United States and identify the early founders, describe daily life (political, social, and economic organization and structure), and describe early colonial resistance to British rule.

Historical Thinking

> Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

5.5. Create and interpret timelines showing major people, events and developments in the early history of the United States.

5.6. Use primary and secondary sources to formulate historical questions, to examine an historical account about an issue of the time, and to reconstruct the literal meaning of the passages by identifying who was involved, what happened, where it happened, and what events led to these developments and what consequences or outcomes followed.

Geography

> Understand and use geographic skills and concepts to interpret contemporary and historical issues.

5.7. Identify, locate, and describe places and regions in the United States.

5.8. Use various types of maps to describe and explain the United States.

5.9. Explain migration, trade, and cultural patterns in the United States.

5.10. Describe how physical and political features influence events, movements, and adaptation to the environment.

5.11. Describe how technological developments, societal decisions, and personal practices influence sustainability in the United States.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

5.12. Analyze how cooperation and conflict among people contribute to political, economic and social events and situations in the United States.

5.13. Describe and summarize how colonial and new states' governments affected groups within their population (e.g., citizens, slaves, foreigners, nobles, women, class systems, tribes).

5.14. Compare and contrast tribal forms of government, British monarchy, and early American colonial governments.

5.15. Identify principles of U.S. democracy found in the U.S. Constitution and Bill of Rights.

5.16. Describe how national government affects local and state government.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

5.17. Explain ways trade can be restricted or encouraged (e.g., boycott) and how these affect producers and consumers.

5.18. Explain the purpose of taxes and give examples from U.S. history of their use.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

5.19. Analyze two accounts of the same event or topic and describe important similarities and differences.

5.20. Gather, use and document information from multiple sources (e.g., print, electronic, human, primary, secondary) to examine an event, issue, or problem through inquiry and research.

5.21. Identify and study two or more points of view of an event, issue or problem.

5.22. Identify characteristics of an event, issue, or problem, suggesting possible causes and results.

5.23. Propose a response or solution to an issue or problem and support why it makes sense, using support from research.

Sixth Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): World History & Geography--Western Hemisphere

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

6.1. Determine and explain the historical context of key people, cultures, products, events, and ideas over time including the examination of different perspectives from people involved including, but not limited to, Aztec, Maya, Inca, Inuit, early Native American cultures of North America, major explorers, colonizers of countries in the Western Hemisphere, and the Columbian Exchange.

6.2. Identify examples of the social, political, cultural, and economic development in key areas of the Western Hemisphere.

6.3. Describe the rise; the political, technological, and cultural achievements; and the decline of ancient civilizations in Europe, Asia, and Africa prior to the Roman Empire.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

6.4. Explain how different cultures in the Western Hemisphere record history.

6.5. Critique information to determine if it is sufficient to answer historical questions.

6.6. Create and compare timelines that identify major people, events and developments in the history of individual civilizations and/or countries that comprise the Americas.

6.7. Define and use the terms “decade,” “century,” and “millennium,” and compare alternative ways that historical periods and eras are designated by identifying the organizing principles upon which each is based.

6.8. Analyze cause-and-effect relationships, including the importance of individuals, ideas, human interests and beliefs.

6.9. Differentiate between fact and interpretation in historical accounts and explain the meaning of historical passages by identifying who was involved, what happened, where it happened, and relating them to outcomes that followed and gaps in the historical record.

6.10. Identify issues related to a historical event in the Americas and give basic arguments for and against that issue utilizing the perspectives, interests and values of those involved.

Geography

> Understand and use geographic skills and concepts to interpret contemporary and historical issues.

6.11. Distinguish among different types of maps and use them to analyze an issue in the Western Hemisphere.

6.12 Collect and analyze data to describe regions of the Western Hemisphere.

6.13. Classify and analyze the types of connections between places in the Western Hemisphere.

6.14. Identify physical features of the Western Hemisphere and explain their effects on people and events.

6.15. Explain how people have adapted to or changed the physical environment in the Western Hemisphere.

6.16. Explain how technological developments, societal decisions, and personal practices influence sustainability in the Western Hemisphere.

Civics and Government

> Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

6.17. Compare and contrast early forms of government via the study of early civilizations (tribal, monarchy, democracy, theocracy, and oligarchy) in the Western Hemisphere.

6.18. Describe current forms of government in countries in the Western Hemisphere.

Economics/Financial Literacy

> Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

6.19. Describe the role and function of prices in the economy.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

6.20. Critique information to determine if it is sufficient to answer questions.

6.21. Clarify key aspects of an event, issue, or problem through inquiry and research.

6.22. Gather, interpret, document, and use information from multiple sources, distinguishing facts from opinions and recognizing points of view.

6.23. Interpret documents and data from multiple primary and secondary sources (art, artifacts, eyewitness accounts, letters and diaries, real or simulated historical sites, charts, graphs, diagrams, written texts).

Seventh Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): World History – Eastern Hemisphere

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

7.1. Describe and compare the beliefs, the spread, and the influence of religions throughout Europe, Asia, and Africa, Islam, Crusades, Holy Roman Empire.

7.2. Examine the importance of trade routes and trace the rise of cultural centers and trade cities in Europe, Asia, and Africa.

7.3. Analyze the interconnections of people, places and events in the economic, scientific and cultural exchanges of the European Renaissance that led to the Scientific Revolution, voyages of discovery and imperial conquest.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

7.4. Explain how and why cultures in the Eastern Hemisphere record history in different ways.

7.5. Create and compare timelines that identify major people and events and developments in the history of civilization and/or countries of Africa, Asia and the Southwest Pacific.

7.6. Form historical questions and use a variety of information resources to find, summarize and evaluate historical data on the people places, events and developments that have played a part in the history of Africa, Asia and the Southwest Pacific.

7.7. Interpret documents and data from multiple primary and secondary sources (e.g., art, artifacts, eyewitness accounts, letters and diaries, real or simulated historical sites, charts, graphs, diagrams, written texts) while forming historical questions.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

7.8. Use and evaluate maps, graphs, charts, models, and databases to analyze geographic distributions in the Eastern Hemisphere.

7.9. Collect and analyze data to make geographic inferences and predictions regarding the Eastern Hemisphere.

7.10. Interpret maps and other geographic tools to find patterns in human and physical systems in the Eastern Hemisphere.

7.11. Describe the physical environment of places in the Eastern Hemisphere and how it influences trade, culture, and the economy.

7.12. Compare and analyze human characteristics (e.g., population, land use, language, and religion) of places and regions in the Eastern Hemisphere.

7.13. Describe the historical and current physical, cultural, and economic characteristics of eco-regions.

7.14. Explain how technological developments, societal decisions, and personal practices influence sustainability in the Eastern Hemisphere.

7.15. Determine and explain the interdependence of people around the world during significant eras or events.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

7.16. Describe the role of citizens in various governments in the Eastern Hemisphere.

7.17. Compare and contrast early forms of government via the study of early civilizations (tribal, monarchy, democracy, theocracy, and oligarchy) in the Eastern Hemisphere.

7.18. Investigate current issues in the Eastern Hemisphere and how they relate to other countries, including the United States.

7.19. Analyze the significance of the Magna Carta, Hammurabi's Code and other documents on the development of modern governments.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

7.20. Explain the concepts of "supply" and "demand" and how price allocates scarce goods.

7.21. Explain the function of imports and exports in the economy.

7.22. Explain "outsourcing" and describe the costs and benefits.

7.23. Explain the function of profit in the economy.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

7.24. Analyze current and historical sources (e.g., artifacts, eyewitness accounts, letters and diaries, real or simulated historical sites, charts, graphs, diagrams, and written texts) for accuracy and point of view while forming questions.

7.25. Analyze evidence from multiple sources including those with conflicting information.

Eighth Grade

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): U.S. History – 1765 - Reconstruction

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

8.1. Evaluate continuity and change over the course of United States history by analyzing examples of conflict, cooperation, and interdependence among groups, societies, or nations.

8.2. Evaluate continuity and change over the course of Unites States history, by analyzing key people and constitutional convention, age of Jefferson, industrial revolution, westward expansion, Civil War.

8.3. Examine social, political and economic factors that caused westward expansion from American Revolution through reconstruction.

8.4. Evaluate the impact of different factors, including gender, age, ethnicity and class on groups and individuals during this time period and the impact these groups and individuals have on events of the time.

8.5. Analyze the causes as outlined in the Declaration of Independence, and examine the major American and British leaders, key events, international support, and consequences of (e.g., Articles of Confederation, changes in trade relationships, achievement of independence by the United States) the American Revolution.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

8.6. Use and interpret documents and other relevant primary and secondary sources pertaining to U.S. History from multiple perspectives.

8.7. Analyze evidence from multiple sources including those with conflicting accounts about specific events in U.S. History.

8.8. Evaluate information from a variety of sources and perspectives.

8.9. Construct or evaluate a written historical argument demonstrating an understanding of primary and secondary sources.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

8.10. Interpret maps to identify growth and development of the United States.

8.11. Identify and describe patterns and networks of economic interdependence, migration, and settlement.

8.12. Investigate how differing geographic perspectives apply to issues in U.S. History.

8.13. Explain how current and historical technological developments, societal decisions, and personal practices influence sustainability in the United States.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

8.14. Explain rights and responsibilities of citizens.

8.15. Contrast the impact of the Articles of Confederation as a form of government to the U.S. Constitution.

8.16. Compare and contrast how European governments and the United States government interacted with Native American peoples.

8.17. Examine the development activities of political parties and interest groups and their affect on events, issues, and ideas.

8.18. Examine and analyze important United States documents, including (but not limited to) the Constitution, Bill of Rights, 13th-15th Amendments.

8.19. Examine important Supreme Court decisions prior to 1880 and the impact of the decisions on government practices, personal liberties, and property rights.

8.20. Analyze the changing definition of citizenship and the expansion of rights.

8.21. Analyze important political and ethical values such as freedom, democracy, equality, and justice embodied in documents such as the Declaration of Independence, the United States Constitution, and the Bill of Rights.

Economics/Financial Literacy

Understand economic concepts and principles and how available resources are allocated in a market and other economies. Understand and apply knowledge and skills to manage one’s financial resources effectively for lifetime financial security.

8.22. Distinguish among tariffs, quotas, and government policies as means to regulate trade.

8.23. Describe how industrialization changes production and how it creates shifts in the market.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

8.24. Compare fictional portrayals of a time, place, or character to historical or other non-fictional sources relating to the same period.

8.25. Critique data for point of view, historical context, distortion, or propaganda and relevance.

8.26. Examine a controversial event, issue, or problem from more than one perspective.

8.27. Examine the various characteristics, causes, and effects of an event, issue, or problem.

8.28. Investigate a response or solution to an issue or problem and support or oppose, using research.

High School

It is essential that these standards be addressed in contexts that promote Social Science Analysis, civic responsibility, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues. Focus (to include but not limited to): US History – Reconstruction to Present; World History – 20th and 21st Century

Historical Knowledge

Relate significant events and eras in local, state, United States, and world history to past and present issues and developments.

HS.1. Evaluate continuity and change over the course of world and United States history.

HS.2. Analyze the complexity and investigate causes and effects of significant events in world, U.S., and Oregon history.

HS.3. Explain the historical development and impact of major world religions and philosophies.

HS.4. Investigate the historical development and impact of major scientific and technological innovations; political thought, theory and actions; and art and literature on culture and thought.

HS.5. Examine and evaluate the origins of fundamental political debates and how conflict, compromise, and cooperation have shaped national unity and diversity in world, U.S., and Oregon history.

HS.6. Analyze ideas critical to the understanding of history, including, but not limited to: populism, progressivism, isolationism, imperialism, communism, environmentalism, liberalism, fundamentalism, racism, ageism, classism, conservatism, cultural diversity, feminism, and sustainability.

HS.7. Analyze the history, culture, tribal sovereignty, and historical and current issues of the American Indian tribes and bands in Oregon and the United States.

HS.8. Explain how the American labor movement influenced events and thinking in the United States and Oregon over time.

HS.9. Identify historical and current events, issues, and problems when national interests and global interest have been in conflict, and analyze the values and arguments on both sides of the conflict.

Historical Thinking

Use multiple perspectives, primary sources, context, and reasoning skills to understand the significance of events, people, ideas and institutions.

HS.10. Evaluate an historical source for point of view and historical context.

HS.11. Gather and analyze historical information, including contradictory data, from a variety of primary and secondary sources, including sources located on the Internet, to support or reject hypotheses.

HS.12. Construct and defend a written historical argument using relevant primary and secondary sources as evidence.

HS.13. Differentiate between facts and historical interpretations, recognizing that a historian’s narrative reflects his or her judgment about the significance of particular facts.

Geography

Understand and use geographic skills and concepts to interpret contemporary and historical issues.

HS.14. Create and use maps, technology, imagery and other geographical representations to extrapolate and interpret geographic data.

HS.15. Analyze and illustrate geographic issues by synthesizing data derived from geographic representations.

HS.16. Analyze the interconnectedness of physical and human regional systems (e.g., a river valley and culture, water rights/use in regions, choice/impact of settlement locations) and their interconnectedness to global communities.

HS.17. Explain how migration, immigration and communication (cultural exchange, convergence and divergence) lead to cultural changes and make predictions and draw conclusions about the global impact of cultural diffusion.

HS.18. Analyze the impact of human migration on physical and human systems (e.g., urbanization, immigration, urban to rural).

HS.19. Evaluate how differing points of view, self-interest, and global distribution of natural resources play a role in conflict over territory.

HS.20. Analyze the impact on physical and human systems of resource development, use, and management and evaluate the issues of sustainability.

HS.21. Relate trends in world population to current events and analyze their interrelationship.

HS.22. Analyze how humans have used technology to modify the physical environment (e.g., dams, tractor, housing types).

HS.23. Analyze distribution and characteristics of human settlement patterns.

Civics and Government

Understand and apply knowledge about governmental and political systems, and the rights and responsibilities of citizens.

HS.24. Analyze and critique the impact of constitutional amendments.

HS.25. Describe elements of early governments (i.e., Greek, Roman, English, and others) that are visible in United States government structure.

HS.26. Define and compare/contrast United States republican government to direct democracy, socialism, communism, theocracy, oligarchy.

HS.27. Examine functions and process of United States government.

HS.28. Evaluate how governments interact at the local, state, tribal, national, and global levels.

HS.29. Examine the structures and functions of Oregon’s state, county, local and regional governments.

HS.30. Analyze the roles and activities of political parties, interest groups and mass media and how they affect the beliefs and behaviors of local, state, and national constituencies.

HS.31. Describe United States foreign policy and evaluate its impact on the United States and other countries.

HS.32. Examine and evaluate documents and decisions related to the Constitution and Supreme Court decisions (e.g., Federalist Papers, Constitution, Marbury v. Madison, Bill of Rights, Constitutional amendments, Declaration of Independence).

HS.33. Explain the role of government in various current events.

HS.34. Explain the responsibilities of citizens (e.g., vote, pay taxes).

HS.35. Examine the pluralistic realities of society (e.g., race, poverty, gender, and age), recognizing issues of equity, and evaluating need for change.

Financial Literacy

> Understand and apply knowledge and skills to manage one's financial resources effectively for lifetime financial security.

HS.36. Identify sources of credit and the advantages and disadvantages of using them and explain the significance of developing a positive credit rating and describe the advantages it can provide, the inherent cost of maintaining a credit card balance, and the risk of accumulating too much debt, identifying "good debt" versus "bad debt."

HS.37. Explain and analyze the kinds and costs of insurance.

HS.38. Explain how consumers can protect themselves from fraud, identity theft, bankruptcy, and foreclosure.

HS.39. Compare and contrast tools for payment (e.g., cash, credit, check, debit card, phone, mobile) and explain the advantages and disadvantages of each.

HS.40. Identify and explain different opportunities for investment and draw economic conclusions from market data.

HS.41. Demonstrate the ability to prepare and file simple state and federal tax forms.

HS.42. Compare and contrast different options for long term investment (e.g., stocks, bond, CDs, mutual funds IRA, 401k, pension plans, Social Security).

HS.43. Compare and contrast of various types of loans available and how to obtain them, including student loans.

HS.44. Describe advantages and disadvantages of on-line banking options.

HS.45. Explain how to prepare a budget that allows for "living within one's means."

Economics

> Understand economic concepts and principles and how available resources are allocated in a market and other economies.

HS.46. Distinguish between fiscal and monetary policies, and describe the role and function of the Federal Reserve.

HS.47. Explain how the global economy has developed and describe the involvement of free trade, comparative advantage, IMF, WTO, World Bank, and technology.

HS.48. Explain economic challenges to growth in developing countries.

HS.49. Compare and contrast methods of business organization.

HS.50. Explain how economic indicators (including, but not limited to GDP, unemployment, Consumer Price Index [CPI], inflation) describe the condition of the economy.

HS.51. Explain how supply and demand represent economic activity and describe the factors that cause them to shift. Define economic terms (e.g., elasticity, substitution, regulation, legislation) and identify examples of them in the current economy.

HS.52. Explain how the American labor system impacts competition and trade in domestic and world markets.

HS.53. Describe characteristics of command, market, traditional, and mixed economies and how they affect jobs and standards of living.

HS.54. Explain the function of the stock market.

HS.55. Explain business cycles and how they affect producers and consumers.

HS.56. Describe the "circular flow" of economic activity and the role of producers, consumers, and government.

Social Science Analysis

Design and implement strategies to research for reliable information, analyze issues, explain perspectives, and resolve issues using the social sciences.

HS.57. Define, research, and explain an event, issue, problem, or phenomenon and its significance to society.

HS.58. Gather, analyze, use, and document information from various sources, distinguishing facts, opinions, inferences, biases, stereotypes, and persuasive appeals.

HS.59. Demonstrate the skills and dispositions needed to be a critical consumer of information.

HS.60. Analyze an event, issue, problem, or phenomenon from varied or opposing perspectives or points of view.

HS.61. Analyze an event, issue, problem, or phenomenon, identifying characteristics, influences, causes, and both short- and long-term effects.

HS.62. Propose, compare, and judge multiple responses, alternatives, or solutions to issues or problems; then reach an informed, defensible, supported conclusion.

HS.63. Engage in informed and respectful deliberation and discussion of issues, events, and ideas.

Core Standards Describing a Prepared Graduate

The Core Standards describe the knowledge and skills expected of a prepared Oregon high school graduate. It is essential that these standards be addressed in contexts that promote

Social Science Analysis, civic responsibility and engagement, understanding global relationships, enhanced communication, making connections between the past, present and future, and the ability to evaluate historical and contemporary issues.

History

1. Analyze and apply cause and effect relationships to a variety of historical issues, events and problems.

2. Analyze and apply change and continuity relationships to a variety of historical issues, events, and problems.

3. Construct, support, and refute interpretations of history using political, social, economic, and cultural perspectives by drawing from a variety of primary and secondary sources.

4. Interpret historical perspectives through personal, local, state, tribal, national, and global narratives.

Geography

5. Apply geographic skills, concepts, and technologies (e.g., maps, GIS, Google Earth) to gather, display, and analyze spatial information.

6. Analyze economic, social, human migration, settlement, and distribution patterns.

7. Locate and examine physical and human characteristics of places and regions, their impact on developing societies, and their connections and interdependence.

8. Evaluate how human cooperation and competition for resources shape the earth's political, economic, physical, and social environments.

9. Evaluate how technological developments, societal decisions, and personal decisions and actions influence the earth's sustainability.

Civics and Government

10. Examine the relationship between government and citizens to distinguish and evaluate the ways that civic participation occurs in local, state, tribal, national, and global communities.

11. Engage in informed and respectful deliberation of local, state, tribal, national, and global issues.

12. Analyze the structure and functions of political parties, interest groups, and the mass media and their affect on the political beliefs and behaviors of citizens.

13. Evaluate the contributions of early governments to the development of modern United States government.

14. Evaluate the various functions and processes of governments and their impact on societies and citizens, comparing and contrasting various government designs to evaluate how they serve their citizens.

15. Identify defining documents and speeches of United States government and the specific purpose and significance of each.

16. Examine the pluralistic realities of society (e.g., race, poverty, gender, and age), recognizing issues of equity, and evaluating need for change.

Economics

17. Examine the structure and functions of the US economy to analyze the impact of systemic decisions on personal, local, regional, national and global economies.

18. Examine the interdependence of economic systems and institutions and its effects upon individual, local, regional, national, and global decision-making.

19. Examine economic growth and use economic indicators to evaluate the condition of market systems.

20. Explain how changes in economic markets are related to availability of resources, production, distribution, and technological developments.

21. Analyze the allocation of scarce resources through individual choice, market interaction, and public policy.

Financial Literacy

22. Acquire the knowledge and economic reasoning skills to make sound personal financial decisions to meet long and short term goals.

23. Understand and apply key concepts of personal income potential, risk management, and investment.

24. Examine individual responsibility and the impact of decisions on personal, local, regional, national and global economies.

Social Science Analysis

25. Define and clarify an issue so that its dimensions are well understood.

26. Acquire, organize, analyze and evaluate information from primary and secondary sources.

27. Describe various perspectives on an event or issue and the reasoning behind them.

28. Analyze characteristics, causes, and consequences of an event, issue, problem or phenomenon.

29. Identify, compare, and evaluate outcomes, responses, or solutions; then reach an informed and supported conclusion.

Section 9

Oregon State Standards

Science

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Science

Kindergarten

Kindergarten science students learn about the living and non-living things in the natural world as they compare and contrast characteristics of plants and animals and examine the way things move. They identify changes in the things seen in the sky and that the sun warms Earth. Exploring questions and making observations about the natural world and designed structures creates the foundation for more advanced understanding of scientific inquiry and engineering design.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

K.1 Structure and Function: The natural world includes living and non-living things.

K.1P.1 Compare and contrast characteristics of living and non-living things.

K.1L.1 Compare and contrast characteristics of plants and animals.

K.1E.1 Gather evidence that the sun warms land, air, and water.

K.2 Interaction and Change: Living and non-living things move.

K.2P.1 Examine the different ways things move.

K.2E.1 Identify changes in things seen in the sky.

K.3 Scientific Inquiry: Science explores the natural world through observation.

K.3S.1 Explore questions about living and non-living things and events in the natural world.

K.3S.2 Make observations about the natural world

K.4 Engineering Design: Engineering design is used to design and build things.

Science Numbering Key Example: K.2P.1
K = Grade
2 = Core Standard strand (strands are 1=Structure and Function; 2=Interaction and change; 3=Scientific Inquiry; 4=Engineering Design)
P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
1 = Number of the content standard for this grade, strand, and discipline

K.4D.1 Create structures using natural or designed materials and simple tools.

K.4D.2 Show how components of designed structures can be disassembled and reassembled.

First Grade

First grade science students build their basic understanding of the natural world through examination of characteristics and properties of objects, living organisms, and Earth materials. They begin to develop an understanding of how living and non-living things interact as they learn about the basic needs of living things and the motion of objects when a force is applied. Students explore the use of basic tools in observing the natural world and in engineering design. They develop their skills in making and recording observations and their understanding of scientific inquiry and engineering design.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

1.1 Structure and Function: Living and non-living things have characteristics and properties.

1.1P.1 Compare and contrast physical properties and composition of objects.

1.1L.1 Compare and contrast characteristics among individuals within one plant or animal group.

1.1E.1 Examine characteristics and physical properties of Earth materials.

1.2 Interaction and Change: Living and non-living things interact.

1.2P.1 Describe the motion of objects when a force is applied.

1.2L.1 Describe the basic needs of living things.

1.3 Scientific Inquiry: Science explores the natural world using evidence from observations.

1.3S.1 Identify and use tools to make careful observations and answer questions about the natural world.

1.3S.2 Record observations with pictures, numbers, or written statements.

Science Numbering Key Example: K.2P.1
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P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
1 = Number of the content standard for this grade, strand, and discipline

1.3S.3 Describe why recording accurate observations is important in science.

1.4 Engineering Design: Engineering design is used to design and build things to meet a need.

1.4D.1 Identify basic tools used in engineering design.

1.4D.2 Demonstrate that designed structures have parts that work together to perform a function.

1.4D.3 Show how tools are used to complete tasks every day.

Second Grade

Second grade science students refine their understanding of the natural world through investigation of the variation and change in living and non-living things. They explore how things respond to magnetic forces, the life cycles of living things, movement of the sun and moon, and daily and seasonal temperature changes. Students develop their skills in observing, measuring, recording, and organizing data, and making predictions based on observations. They use tools and work with a team to refine their engineering design skills.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

2.1 Structure and Function: Living and non-living things vary throughout the natural world.

2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

2.2 Interaction and Change: Living and non-living things change.

2.2P.1 Compare and contrast how objects and materials respond to magnetic forces.

2.2L.1 Describe life cycles of living things.

2.2E.1 Observe and record the patterns of apparent movement of the sun and the moon.

2.2E.2 Record and summarize daily and seasonal temperature changes.

Science Numbering Key Example: K.2P.1
K = Grade
2 = Core Standard strand (strands are 1=Structure and Function; 2=Interaction and change; 3=Scientific Inquiry; 4=Engineering Design)
P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
1 = Number of the content standard for this grade, strand, and discipline

2.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations.

2.3S.1 Observe, measure, and record properties of objects and substances using simple tools to gather data and extend the senses.

2.3S.2 Make predictions about living and non-living things and events in the environment based on observed patterns.

2.3S.3 Make, describe, and compare observations, and organize recorded data.

2.4 Engineering Design: Engineering design is a process used to design and build things to solve problems or address needs.

2.4D.1 Use tools to construct a simple designed structure out of common objects and materials.

2.4D.2 Work with a team to complete a designed structure that can be shared with others.

2.4D.3 Describe an engineering design that is used to solve a problem or address a need.

Third Grade

Third grade science students develop their understanding of the variation in living and non-living things and their interaction with energy and forces. They explore physical properties of the states of matter and how forces affect an object's position, motion, and speed. Students investigate the life cycles of plants and animals and characteristics of organisms and their offspring. They study Earth's seasonal weather patterns of precipitation and temperature. Students learn the basic concepts of scientific inquiry as they make observations, ask questions or form hypotheses, plan a simple investigation, and collect and use data to explain the results and draw conclusions. Students build their understanding of engineering design as they identify a problem, propose a potential solution, design a prototype, and learn how inventions have changed the way people live and pursue science.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

3.1 Structure and Function: Living and non-living things vary in their characteristics and properties.

Science Numbering Key Example: K.2P.1
K = Grade
2 = Core Standard strand (strands are 1=Structure and Function; 2=Interaction and change; 3=Scientific Inquiry; 4=Engineering Design)
P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
1 = Number of the content standard for this grade, strand, and discipline

3.1P.1 Compare and contrast the properties of states of matter.

3.1L.1 Compare and contrast the characteristics of offspring and parents.

3.2 Interaction and Change: Living and non-living things interact with energy and forces.

3.2P.1 Describe how forces cause changes in an object's position, motion, and speed.

3.2L.1 Compare and contrast the life cycles of plants and animals.

3.2E.1 Identify Earth as a planet and describe its seasonal weather patterns of precipitation and temperature.

3.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations and investigations.

3.3S.1 Plan a simple investigation based on a testable question, match measuring tools to their uses, and collect and record data from a scientific investigation.

3.3S.2 Use the data collected from a scientific investigation to explain the results and draw conclusions.

3.3S.3 Explain why when a scientific investigation is repeated, similar results are expected.

3.4 Engineering Design: Engineering design is a process that uses science to solve problems or address needs or aspirations.

3.4D.1 Identify a problem that can be addressed through engineering design, propose a potential solution, and design a prototype.

3.4D.2 Describe how recent inventions have significantly changed the way people live.

3.4D.3 Give examples of inventions that enable scientists to observe things that are too small or too far away.

Fourth Grade

Fourth grade science students build their understanding of the natural world learning how living and non-living things are classified by their characteristics and properties. Students study physical changes in matter, the properties of energy, and how objects vary in the way they interact with energy. They compare and contrast fossils and living organisms, and learn

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1 = Number of the content standard for this grade, strand, and discipline

about interactions of organisms and their environment. They study Earth materials and the changes that take place on Earth's surface. Students build their scientific inquiry skills as they develop testable questions, design an investigation, and collect, record, summarize, and use the results to confirm and support a logical argument. They also develop their use of science and engineering design skills as they learn to identify a problem and design, construct, and test a possible solution.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

4.1 Structure and Function: Living and non-living things can be classified by their characteristics and properties.

4.1P.1 Describe the properties of forms of energy and how objects vary in the extent to which they absorb, reflect, and conduct energy.

4.1L.1 Compare and contrast characteristics of fossils and living organisms.

4.1E.1 Identify properties, uses, and availability of Earth materials.

4.2 Interaction and Change: Living and non-living things undergo changes that involve force and energy.

4.2P.1 Describe physical changes in matter and explain how they occur.

4.2L.1 Describe the interactions of organisms and the environment where they live.

4.2E.1 Compare and contrast the changes in the surface of Earth that are due to slow and rapid processes.

4.3 Scientific Inquiry: Scientific inquiry is a process of investigation through questioning, collecting, describing, and examining evidence to explain natural phenomena and artifacts.

4.3S.1 Based on observations identify testable questions, design a scientific investigation, and collect and record data consistent with a planned scientific investigation.

4.3S.2 Summarize the results from a scientific investigation and use the results to respond to the question being tested.

Science Numbering Key Example: K.2P.1
K = Grade
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P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
1 = Number of the content standard for this grade, strand, and discipline

4.3S.3 Explain that scientific claims about the natural world use evidence that can be confirmed and support a logical argument.

4.4 Engineering Design: Engineering design is a process of using science principles to solve problems generated by needs and aspirations.

4.4D.1 Identify a problem that can be addressed through engineering design using science principles.

4.4D.2 Design, construct, and test a prototype of a possible solution to a problem using appropriate tools, materials, and resources.

4.4D.3 Explain how the solution to one problem may create other problems.

Fifth Grade

Fifth grade science students develop an understanding of living and non-living things as systems composed of related parts that function together and interact with force, energy, and matter. They investigate the Sun-Earth-Moon system, how energy from the sun affects Earth's weather and climate, and how forces affect objects on Earth. They study adaptation and the interdependence of organisms and the environment. Students extend their work with scientific inquiry, designing and conducting simple investigations to answer questions or test hypotheses, and collecting, organizing, summarizing, analyzing, and interpreting data. They also extend their work with engineering design using science principles to describe, design, and build a solution to a problem given criteria and constraints. Students learn that inventions may lead to other inventions.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

5.1 Structure and Function: Living and non-living things are composed of related parts that function together to form systems.

5.1L.1 Explain that organisms are composed of parts that function together to form a living system.

5.1E.1 Describe the Sun-Earth-Moon system.

5.2 Interaction and Change: Force, energy, matter, and organisms interact within living and non-living systems.

Science Numbering Key Example: K.2P.1
K = Grade
2 = Core Standard strand (strands are 1=Structure and Function; 2=Interaction and change; 3=Scientific Inquiry; 4=Engineering Design)
P = Science Discipline (disciplines are P = Physical; L = Life; E = Earth and Space; S = Scientific inquiry; D = Engineering Design)
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5.2P.1 Describe how friction, gravity, and magnetic forces affect objects on or near Earth.

5.2L.1 Explain the interdependence of plants, animals, and environment, and how adaptation influences survival.

5.2E.1 Explain how the energy from the sun affects Earth's weather and climate.

5.3 Scientific Inquiry: Scientific inquiry is a process of investigation based on science principles and questioning, collecting, describing, and examining evidence to explain natural phenomena and artifacts.

5.3S.1 Based on observations and science principles, identify questions that can be tested, design an experiment or investigation, and identify appropriate tools. Collect and record multiple observations while conducting investigations or experiments to test a scientific question or hypothesis.

5.3S.2 Identify patterns in data that support a reasonable explanation for the results of an investigation or experiment and communicate findings using graphs, charts, maps, models, and oral and written reports.

5.3S.3 Explain the reasons why similar investigations may have different results.

5.4 Engineering Design: Engineering design is a process of using science principles to make modifications in the world to meet human needs and aspirations.

5.4D.1 Using science principles describe a solution to a need or problem given criteria and constraints.

5.4D.2 Design and build a prototype of a proposed engineering solution and identify factors such as cost, safety, appearance, environmental impact, and what will happen if the solution fails.

5.4D.3 Explain that inventions may lead to other inventions and once an invention exists, people may think of novel ways of using it.

Sixth Grade

Sixth grade science students refine their understanding of living and non-living systems as organized groups of related parts that function together, interact, and change. They investigate physical and chemical properties of matter, and energy. They study waves, electricity, and magnetism. Students learn about types, functions, components, relationships, and interactions of cells, tissues, organs, and organ systems, and changes in populations and ecosystems. Students study objects in the solar system, the layers of Earth, and the relationship of the water cycle to landforms and weather. They use their scientific inquiry skills to investigate the natural world through observing, proposing questions or hypotheses, and

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Science Numbering Key Example: K.2P.1
K = Grade
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collecting, analyzing, and interpreting data to produce justifiable evidence-based explanations. Students apply their knowledge of science principles to engineering design by identifying problems, and proposing, testing, and evaluating potential solutions.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

6.1 Structure and Function: Living and non-living systems are organized groups of related parts that function together and have characteristics and properties.

6.1P.1 Describe physical and chemical properties of matter and how they can be measured.

6.1P.2 Compare and contrast the characteristic properties of forms of energy.

6.1L.1 Compare and contrast the types and components of cells. Describe the functions and relative complexity of cells, tissues, organs, and organ systems.

6.1E.1 Describe and compare the properties and composition of the layers of Earth.

6.1E.2 Describe the properties of objects in the solar system. Describe and compare the position of the sun within the solar system, galaxy, and universe.

6.2 Interaction and Change: The related parts within a system interact and change.

6.2P.1 Describe and compare types and properties of waves and explain how they interact with matter.

6.2P.2 Describe the relationships between: electricity and magnetism, static and current electricity, and series and parallel electrical circuits.

6.2L.1 Describe the relationships and interactions between and among cells, tissues, organs, and organ systems.

6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

6.2E.1 Explain the water cycle and the relationship to landforms and weather.

Science Numbering Key Example: K.2P.1
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1 = Number of the content standard for this grade, strand, and discipline

6.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, and developing procedures for questioning, collecting, analyzing, and interpreting accurate and relevant data to produce justifiable evidence-based explanations.

6.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct an investigation that uses appropriate tools and techniques to collect relevant data.

6.3S.2 Organize and display relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions.

6.3S.3 Explain why if more than one variable changes at the same time in an investigation, the outcome of the investigation may not be clearly attributable to any one variable.

6.4 Engineering Design: Engineering design is a process of identifying needs, defining problems, developing solutions, and evaluating proposed solutions.

6.4D.1 Define a problem that addresses a need and identify science principles that may be related to possible solutions.

6.4D.2 Design, construct, and test a possible solution to a defined problem using appropriate tools and materials. Evaluate proposed engineering design solutions to the defined problem.

6.4D.3 Describe examples of how engineers have created inventions that address human needs and aspirations.

Seventh Grade

Seventh grade science students refine their understanding of how the components and processes within living and non-living systems interact and affect their characteristics and properties. They learn about gravitation, forces, and laws of motion. They study atoms, elements, and compounds. They develop an understanding of reproduction, inheritance, phenotypes, genotypes, chromosomes, and genes. Students learn about the processes plants and animals use to obtain energy and materials for growth. They study how Earth's atmosphere, land forms, resources, and climate change. Students deepen their understanding of scientific inquiry as the investigation of the natural world based on observation and science principles that includes proposing questions or hypotheses, collecting, analyzing, and interpreting multiple forms of data to produce justifiable evidence-based explanations. They build their understanding of engineering design as a process of identifying needs, problems, and constraints, and developing and evaluating proposed

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solutions.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

7.1 Structure and Function: Living and non-living systems are composed of components which affect the characteristics and properties of the system.

7.1P.1 Explain that all matter is made of atoms, elements are composed of a single kind of atom, and compounds are composed of two or more different elements.

7.1L.1 Compare and contrast sexual and asexual reproduction. Explain why reproduction is essential to the continuation of every species.

7.1L.2 Distinguish between inherited and learned traits, explain how inherited traits are passed from generation to generation, and describe the relationships among phenotype, genotype, chromosomes, and genes.

7.2 Interaction and Change: The components and processes within a system interact.

7.2P.1 Identify and describe types of motion and forces and relate forces qualitatively to the laws of motion and gravitation.

7.2L.1 Explain how organelles within a cell perform cellular processes and how cells obtain the raw materials for those processes.

7.2L.2 Explain the processes by which plants and animals obtain energy and materials for growth and metabolism.

7.2E.1 Describe and evaluate the environmental and societal effects of obtaining, using, and managing waste of renewable and non-renewable resources.

7.2E.2 Describe the composition of Earth's atmosphere, how it has changed over time, and implications for the future.

7.2E.3 Evaluate natural processes and human activities that affect global environmental change and suggest and evaluate possible solutions to problems.

7.2E.4 Explain how landforms change over time at various rates in terms of constructive and destructive forces.

Science Numbering Key Example: K.2P.1
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7.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses, designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations.

7.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools and techniques to collect relevant data.

7.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of an investigation, and communicate the conclusions including possible sources of error.

7.3S.3 Evaluate the validity of scientific explanations and conclusions based on the amount and quality of the evidence cited.

7.4 Engineering Design: Engineering design is a process of identifying needs, defining problems, identifying constraints, developing solutions, and evaluating proposed solutions.

7.4D.1 Define a problem that addresses a need and identify constraints that may be related to possible solutions.

7.4D.2 Design, construct, and test a possible solution using appropriate tools and materials. Evaluate the proposed solutions to identify how design constraints are addressed.

7.4D.3 Explain how new scientific knowledge can be used to develop new technologies and how new technologies can be used to generate new scientific knowledge.

Eighth Grade

Eighth grade science students build their understanding of the complexity and interaction of living and non-living systems. They learn about the Periodic Table, the atomic model, states of matter, and physical and chemical properties. They study physical and chemical changes and the law of conservation of mass. Students examine energy transfers, transformations, and conservation. Life science study includes examination of genetics, anatomical characteristics, natural selection, and evolution. They learn about gravity, the motion of objects in the solar system, and Earth's seasons. They study atmospheric and oceanic movement and the effects on weather and climate, and geologic, climatic, environmental, and life form changes over time. Students use their scientific inquiry skills to ask questions or form hypotheses, design an investigation, collect, organize, display, summarize, and analyze data, explain results, and provide interpretations and implications. They use their engineering

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design skills to define a problem, use science principles to investigate possible solutions given criteria, constraints, priorities, and trade-offs, collect data, evaluate a solution, and identify possible design improvements.

*It is essential that these standards be addressed in contexts that promote scientific inquiry, use of evidence, critical thinking, making connections, and communication.

8.1 Structure and Function: Systems and their components function at various levels of complexity.

8.1P.1 Describe the atomic model and explain how the types and arrangements of atoms determine the physical and chemical properties of elements and compounds.

8.1P.2 Explain how the Periodic Table is an organization of elements based on their physical and chemical properties.

8.1P.3 Explain how the motion and spacing of particles determines states of matter.

8.1L.1 Explain how genetics and anatomical characteristics are used to classify organisms and infer evolutionary relationships.

8.2 Interaction and Change: Systems interact with other systems.

8.2P.1 Compare and contrast physical and chemical changes and describe how the law of conservation of mass applies to these changes.

8.2P.2 Explain how energy is transferred, transformed, and conserved.

8.2L.1 Explain how species change through the process of natural selection. Describe evidence for evolution.

8.2E.1 Explain how gravity is the force that keeps objects in the solar system in regular and predictable motion and describe the resulting phenomena. Explain the interactions that result in Earth's seasons.

8.2E.2 Describe the processes of Earth's geosphere and the resulting major geological events.

8.2E.3 Explain the causes of patterns of atmospheric and oceanic movement and the effects on weather and climate.

8.2E.4 Analyze evidence for geologic, climatic, environmental, and life form changes over time.

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8.3 Scientific Inquiry: Scientific inquiry is the investigation of the natural world based on observations and science principles that includes proposing questions or hypotheses and designing procedures for questioning, collecting, analyzing, and interpreting multiple forms of accurate and relevant data to produce justifiable evidence-based explanations and new explorations.

8.3S.1 Based on observations and science principles, propose questions or hypotheses that can be examined through scientific investigation. Design and conduct a scientific investigation that uses appropriate tools, techniques, independent and dependent variables, and controls to collect relevant data.

8.3S.2 Organize, display, and analyze relevant data, construct an evidence-based explanation of the results of a scientific investigation, and communicate the conclusions including possible sources of error. Suggest new investigations based on analysis of results.

8.3S.3 Explain how scientific explanations and theories evolve as new information becomes available.

8.4 Engineering Design: Engineering design is a process of identifying needs, defining problems, identifying design criteria and constraints, developing solutions, and evaluating proposed solutions.

8.4D.1 Define a problem that addresses a need, and using relevant science principles investigate possible solutions given specified criteria, constraints, priorities, and trade-offs.

8.4D.2 Design, construct, and test a proposed engineering design solution and collect relevant data. Evaluate a proposed design solution in terms of design and performance criteria, constraints, priorities, and trade-offs. Identify possible design improvements.

8.4D.3 Explain how creating a new technology requires considering societal goals, costs, priorities, and trade-offs.

Science Numbering Key Example: K.2P.1
K = Grade
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Next Generation Science Standards

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

DCI Arrangements of the Next Generation Science Standards

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Section 10

Next Generation Science Standards

Elementary Storylines & Standards

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Elementary Standards

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain more complex phenomena in the four disciplines as they progress to middle school and high school. While the performance expectations shown in kindergarten through fifth grade couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

Kindergarten

The performance expectations in kindergarten help students formulate answers to questions such as: "What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?" Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the *NRC Framework*. Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live. The crosscutting concepts of patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

K-PS2 Motion and Stability: Forces and Interactions

K-PS2 Motion and Stability: Forces and interactions

Students who demonstrate understanding can:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world. (K-PS2-1)

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS2-1),(K-PS2-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1),(K-PS2-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS2-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. *(secondary to K-PS2-1)*

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)*

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

Connections to other DCIs in kindergarten: **K.ETS1.A** (K-PS2-2); **K.ETS1.B** (K-PS2-2)

Articulation of DCIs across grade-levels: **2.ETS1.B** (K-PS2-2); **3.PS2.A** (K-PS2-1),(K-PS2-2); **3.PS2.B** (K-PS2-1); **4.PS3.A** (K-PS2-1); **4.ETS1.A** (K-PS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. *(K-PS2-2)*

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. *(K-PS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(K-PS2-1)*

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. *(K-PS2-1)*

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-PS3 Energy

K-PS3 Energy

Students who demonstrate understanding can:

K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2) -- ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** ▪ Scientists use different ways to study the world. (K-PS3-1)	**PS3.B: Conservation of Energy and Energy Transfer** ▪ Sunlight warms Earth's surface. (K-PS3-1),(K-PS3-2)	**Cause and Effect** ▪ Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2)

Connections to other DCIs in kindergarten: **K.ETS1.A** (K-PS3-2); **K.ETS1.B** (K-PS3-2)

Articulation of DCIs across grade-levels: **1.PS4.B** (K-PS3-1),(K-PS3-2); **2.ETS1.B** (K-PS3-2), **3.ESS2.D** (K-PS3-1); **4.ETS1.A** (K-PS3-2)

Common Core State Standards Connections:

ELA/Literacy –

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1),*(K-PS3-2)*

Mathematics –

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-1),(K-PS3-2)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-LS1 From Molecules to Organisms: Structures and Processes

K-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. ▪ Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (K-LS1-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ▪ All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)	**Patterns** ▪ Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1)

Connections to other DCIs in kindergarten: N/A

Articulation of DCIs across grade-levels: **1.LS1.A** (K-LS1-1); **2.LS2.A** (K-LS1-1); **3.LS2.C** (K-LS1-1); **3.LS4.B** (K-LS1-1); **5.LS1.C** (K-LS1-1); **5.LS2.A** (K-LS1-1)

Common Core State Standards Connections:

ELA/Literacy –

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)

Mathematics –

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *(K-LS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-ESS2 Earth's Systems

K-ESS2 Earth's Systems

Students who demonstrate understanding can:

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Engaging in Argument from Evidence
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim. (K-ESS2-2)

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (K-ESS2-1)

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

ESS2.E: Biogeology

- Plants and animals can change their environment. (K-ESS2-2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. *(secondary to K-ESS2-2)*

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Systems and System Models

- Systems in the natural and designed world have parts that work together. (K-ESS2-2)

Connections to other DCIs in kindergarten: N/A

Articulation of DCIs across grade-levels: **2.ESS2.A** (K-ESS2-1); **3.ESS2.D** (K-ESS2-1); **4.ESS2.A** (K-ESS2-1); **4.ESS2.E** (K-ESS2-2); **5.ESS2.A** (K-ESS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)

W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. *(K-ESS2-2)*

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. (K-ESS2-1)

MP.4 Model with mathematics. (K-ESS2-1)

K.CC.A Know number names and the count sequence. (K-ESS2-1)

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)

K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

K-ESS3 Earth and Human Activity

K-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]

K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.

- Use a model to represent relationships in the natural world. (K-ESS3-1)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)
- Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

Disciplinary Core Ideas

ESS3.A: Natural Resources

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)

ESS3.B: Natural Hazards

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. *(secondary to K-ESS3-2)*

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary to K-ESS3-3)*

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (K-ESS3-2),(K-ESS3-3)

Systems and System Models

- Systems in the natural and designed world have parts that work together. (K-ESS3-1)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- People encounter questions about the natural world every day. (K-ESS3-2)

Influence of Engineering, Technology, and Science on Society and the Natural World

- People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

Connections to other DCIs in kindergarten: **K.ETS1.A** (K-ESS3-2),(K-ESS3-3)

Articulation of DCIs across grade-levels: **1.LS1.A** (K-ESS3-1); **2.ESS1.C** (K-ESS3-2); **2.ETS1.B** (K-ESS3-3); **3.ESS3.B** (K-ESS3-2); **4.ESS3.A** (K-ESS3-3); **4.ESS3.B** (K-ESS3-2); **5.LS2.A** (K-ESS3-1); **5.ESS2.A** (K-ESS3-1); **5.ESS3.C** (K-ESS3-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1	With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)
W.K.2	Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. *(K-ESS3-3)*
SL.K.3	Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)
SL.K.5	Add drawings or other visual displays to descriptions as desired to provide additional detail. *(K-ESS3-1)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(K-ESS3-1)*
MP.4	Model with mathematics. *(K-ESS3-1),(K-ESS3-2)*
K.CC	Counting and Cardinality *(K-ESS3-1),(K-ESS3-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

First Grade

The performance expectations in first grade help students formulate answers to questions such as: "What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?" First grade performance expectations include PS4, LS1, LS3, and ESS1 Disciplinary Core Ideas from the *NRC Framework*. Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students are able to observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns; cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

1-PS4 Waves and their Applications in Technologies for Information Transfer

1-PS4 Waves and their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

1-PS4-2. Make observations to construct an evidence-based account that objects can be seen only when illuminated. [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

1-PS4-3. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1),(1-PS4-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2)
- Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Science investigations begin with a question. (1-PS4-1)
- Scientists use different ways to study the world. (1-PS4-1)

Disciplinary Core Ideas

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

PS4.B: Electromagnetic Radiation

- Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)

PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1),(1-PS4-2),(1-PS4-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science, on Society and the Natural World

- People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels: **K.ETS1.A** (1-PS4-4); **2.PS1.A** (1-PS4-3); **2.ETS1.B** (1-PS4-4); **4.PS4.C** (1-PS4-4); **4.PS4.B** (1-PS4-2); **4.ETS1.A** (1-PS4-4)

Common Core State Standards Connections:

ELA/Literacy –

W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. *(1-PS4-2)*

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-PS4-1),(1-PS4-2),(1-PS4-3),(1-PS4-4)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1),(1-PS4-2),(1-PS4-3)

SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. *(1-PS4-1),(1-PS4-2),(1-PS4-3)*

Mathematics –

MP.5 Use appropriate tools strategically. *(1-PS4-4)*

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. *(1-PS4-4)*

1.MD.A.2 Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *(1-PS4-4)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-LS1 From Molecules to Organisms: Structures and Processes

1-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (1-LS1-2)

Disciplinary Core Ideas

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. (1-LS1-1)

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels: **K.ETS1.A** (1-LS1-1); **3.LS2.D** (1-LS1-2); **4.LS1.A** (1-LS1-1); **4.LS1.D** (1-LS1-1); **4.ETS1.A** (1-LS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.1.1 Ask and answer questions about key details in a text. (1-LS1-2)
RI.1.2 Identify the main topic and retell key details of a text. (1-LS1-2)
RI.1.10 With prompting and support, read informational texts appropriately complex for grade. (1-LS1-2)
W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS1-1)

Mathematics –

1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <. *(1-LS1-2)*
1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. *(1-LS1-2)*
1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. *(1-LS1-2)*
1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. *(1-LS1-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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1-LS3 Heredity: Inheritance and Variation of Traits

1-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1)	**LS3.A: Inheritance of Traits** ▪ Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (1-LS3-1) **LS3.B: Variation of Traits** ▪ Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)	**Patterns** ▪ Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS3-1)

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels: **3.LS3.A** (1-LS3-1); **3.LS3.B** (1-LS3-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.1.1 Ask and answer questions about key details in a text. (1-LS3-1)

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS3-1)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-LS3-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(1-LS3-1)*

MP.5 Use appropriate tools strategically. *(1-LS3-1)*

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. *(1-LS3-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

1-ESS1 Earth's Place in the Universe

1-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted. [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]

1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

Disciplinary Core Ideas

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past. (1-ESS1-1)
- Many events are repeated. (1-ESS1-1)

Connections to other DCIs in first grade: N/A

Articulation of DCIs across grade-levels: **3.PS2.A** (1-ESS1-1); **5.PS2.B** (1-ESS1-1),(1-ESS1-2); **5-ESS1.B** (1-ESS1-1),(1-ESS1-2)

Common Core State Standards Connections:

ELA/Literacy –

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-ESS1-1),(1-ESS1-2)

W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-1),(1-ESS1-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(1-ESS1-2)*

MP.4 Model with mathematics. *(1-ESS1-2)*

MP.5 Use appropriate tools strategically. *(1-ESS1-2)*

1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem. *(1-ESS1-2)*

1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. *(1-ESS1-2)*

Second Grade

The performance expectations in second grade help students formulate answers to questions such as: "How does land change and what are some things that cause it to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?" Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1 Disciplinary Core Ideas from the *NRC Framework*. Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth. The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the second grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

2-PS1 Matter and its Interactions

2-PS1 Matter and its Interactions

Students who demonstrate understanding can:

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3)

Engaging in Argument from Evidence

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim. (2-PS1-4)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. (2-PS1-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **4.ESS2.A** (2-PS1-3); **5.PS1.A** (2-PS1-1),(2-PS1-2),(2-PS1-3); **5.PS1.B** (2-PS1-4); **5.LS2.A** (2-PS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1 Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text. *(2-PS1-4)*

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)

RI.2.8 Describe how reasons support specific points the author makes in a text. *(2-PS1-2)*,(2-PS1-4)

W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., *because*, *and*, *also*) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4)

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2),(2-PS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1),(2-PS1-2),(2-PS1-3)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-PS1-2)*

MP.4 Model with mathematics. *(2-PS1-1),(2-PS1-2)*

MP.5 Use appropriate tools strategically. *(2-PS1-2)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(2-PS1-1),(2-PS1-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ▪ Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)	**LS2.A: Interdependent Relationships in Ecosystems** ▪ Plants depend on water and light to grow. (2-LS2-1) ▪ Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) **ETS1.B: Developing Possible Solutions** ▪ Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary to 2-LS2-2)*	**Cause and Effect** ▪ Events have causes that generate observable patterns. (2-LS2-1) **Structure and Function** ▪ The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **K.LS1.C** (2-LS2-1); **K-ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-2)

Common Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-LS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-LS2-1)*

MP.4 Model with mathematics. *(2-LS2-1),(2-LS2-2)*

MP.5 Use appropriate tools strategically. *(2-LS2-1)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. *(2-LS2-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-LS4 Biological Evolution: Unity and Diversity

2-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. ▪ Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1) --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Scientists look for patterns and order when making observations about the world. (2-LS4-1)	**LS4.D: Biodiversity and Humans** ▪ There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)	

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **3.LS4.C** (2-LS4-1); **3.LS4.D** (2-LS4-1); **5.LS2.A** (2-LS4-1)

Common Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS4-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS4-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-LS4-1)*

MP.4 Model with mathematics. *(2-LS4-1)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. *(2-LS4-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-ESS1 Earth's Place in the Universe

2-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly. [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. ▪ Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)	**ESS1.C: The History of Planet Earth** ▪ Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)	**Stability and Change** ▪ Things may change slowly or rapidly. (2-ESS1-1)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **3.LS2.C** (2-ESS1-1); **4.ESS1.C** (2-ESS1-1); **4.ESS2.A** (2-ESS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1 Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text. *(2-ESS1-1)*

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(2-ESS1-1)*

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1)

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-ESS1-1)*

MP.4 Model with mathematics. *(2-ESS1-1)*

2.NBT.A Understand place value. (2-ESS1-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2-ESS2 Earth's Systems

2-ESS2 Earth's Systems

Students who demonstrate understanding can:

2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area. [Assessment Boundary: Assessment does not include quantitative scaling in models.]

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a model to represent patterns in the natural world. (2-ESS2-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Compare multiple solutions to a problem. (2-ESS2-1)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land. (2-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. *(secondary to 2-ESS2-1)*

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)

Stability and Change

- Things may change slowly or rapidly. (2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

- Scientists study the natural and material world. (2-ESS2-1)

Connections to other DCIs in second grade: **2.PS1.A** (2-ESS2-3)

Articulation of DCIs across grade-levels: **K.ETS1.A** (2-ESS2-1); **4.ESS2.A** (2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **4.ETS1.A** (2-ESS2-1); **4.ETS1.B** (2-ESS2-1); **4.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2),(2-ESS2-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. *(2-ESS2-1)*

RI.2.9 Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(2-ESS2-3)*

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ESS2-3)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-ESS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-ESS2-1),(2-ESS2-2)*

MP.4 Model with mathematics. *(2-ESS2-1),(2-ESS2-2)*

MP.5 Use appropriate tools strategically. *(2-ESS2-1)*

2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. *(2-ESS2-2)*

2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. *(2-ESS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-2-ETS1 Engineering Design

K-2-ETS1 Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Connections to K-2-ETS1.A: Defining and Delimiting Engineering Problems include:

Kindergarten: K-PS2-2, K-ESS3-2

Connections to K-2-ETS1.B: Developing Possible Solutions Problems include:

Kindergarten: K-ESS3-3, **First Grade:** 1-PS4-4, **Second Grade:** 2-LS2-2

Connections to K-2-ETS1.C: Optimizing the Design Solution include:

Second Grade: 2-ESS2-1

Articulation of DCIs across grade-bands: **3-5.ETS1.A** (K-2-ETS1-1),(K-2-ETS1-2),(K-2-ETS1-3); **3-5.ETS1.B** (K-2-ETS1-2),(K-2-ETS1-3); **3-5.ETS1.C** (K-2-ETS1-1),(K-2-ETS1-2),(K-2-ETS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1	Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text. (K-2-ETS1-1)
W.2.6	With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(K-2-ETS1-1),(K-2-ETS1-3)*
W.2.8	Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1),*(K-2-ETS1-3)*
SL.2.5	Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(K-2-ETS1-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(K-2-ETS1-1),(K-2-ETS1-3)*
MP.4	Model with mathematics. *(K-2-ETS1-1),(K-2-ETS1-3)*
MP.5	Use appropriate tools strategically. *(K-2-ETS1-1),(K-2-ETS1-3)*
2.MD.D.10	Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(K-2-ETS1-1),(K-2-ETS1-3)*

Third Grade

The performance expectations in third grade help students formulate answers to questions such as: "What is typical weather in different parts of the world and during different times of the year? How can the impact of weather-related hazards be reduced? How do organisms vary in their traits? How are plants, animals, and environments of the past similar or different from current plants, animals, and environments? What happens to organisms when their environment changes? How do equal and unequal forces on an object affect the object? How can magnets be used?" Third grade performance expectations include PS2, LS1, LS2, LS3, LS4, ESS2, and ESS3 Disciplinary Core Ideas from the *NRC Framework*. Students are able to organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards. Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by students at this level. In addition, students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems; developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

3-PS2 Motion and Stability: Forces and Interactions

3-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.* [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
- Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1)
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence
- Science findings are based on recognizing patterns. (3-PS2-2)

Scientific Investigations Use a Variety of Methods
- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

Disciplinary Core Ideas

PS2.A: Forces and Motion
- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2)

PS2.B: Types of Interactions
- Objects in contact exert forces on each other. (3-PS2-1)
- Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3),(3-PS2-4)

Crosscutting Concepts

Patterns
- Patterns of change can be used to make predictions. (3-PS2-2)

Cause and Effect
- Cause and effect relationships are routinely identified. (3-PS2-1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **K.PS2.A** (3-PS2-1); **K.PS2.B** (3-PS2-1); **K.PS3.C** (3-PS2-1); **K.ETS1.A** (3-PS2-4); **1.ESS1.A** (3-PS2-2); **4.PS4.A** (3-PS2-2); **4.ETS1.A** (3-PS2-4); **5.PS2.B** (3-PS2-1); **MS.PS2.A** (3-PS2-1),(3-PS2-2); **MS.PS2.B** (3-PS2-3),(3-PS2-4); **MS.ESS1.B** (3-PS2-1),(3-PS2-2); **MS.ESS2.C** (3-PS2-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-PS2-1)*,(3-PS2-3)

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-PS2-3)

RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). *(3-PS2-3)*

W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-1),(3-PS2-2)

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1),*(3-PS2-2)*

SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. *(3-PS2-3)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(3-PS2-1)*

MP.5 Use appropriate tools strategically. *(3-PS2-1)*

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-PS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS1 From Molecules to Organisms: Structures and Processes

3-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena. (3-LS1-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-LS1-1)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-LS1-1)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **MS.LS1.B** (3-LS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). *(3-LS1-1)*

SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. *(3-LS1-1)*

Mathematics –

MP.4 Model with mathematics. *(3-LS1-1)*

3.NBT Number and Operations in Base Ten *(3-LS1-1)*

3.NF Number and Operations—Fractions *(3-LS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

3-LS2-1. Construct an argument that some animals form groups that help members survive.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Construct an argument with evidence, data, and/or a model. (3-LS2-1)	**LS2.D: Social Interactions and Group Behavior** ▪ Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size *(Note: Moved from K–2)*. (3-LS2-1)	**Cause and Effect** ▪ Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **1.LS1.B** (3-LS2-1); **MS.LS2.A** (3-LS2-1); **MS.LS2.D** (3-LS2-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-LS2-1)*

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. *(3-LS2-1)*

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1)

Mathematics –

MP.4 Model with mathematics. (3-LS2-1)

3.NBT Number and Operations in Base Ten (3-LS2-1)

3-LS3 Heredity: Inheritance and Variation of Traits

3-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.
When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)

Disciplinary Core Ideas

LS3.A: Inheritance of Traits

- Many characteristics of organisms are inherited from their parents. (3-LS3-1)
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2)

LS3.B: Variation of Traits

- Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)
- The environment also affects the traits that an organism develops. (3-LS3-2)

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **1.LS3.A** (3-LS3-1); **1.LS3.B** (3-LS3-1); **MS.LS1.B** (3-LS3-2); **MS.LS3.A** (3-LS3-1); **MS.LS3.B** (3-LS3-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS3-1),(3-LS3-2)
RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. *(3-LS3-1),(3-LS3-2)*
RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1),*(3-LS3-2)*
W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. *(3-LS3-1),*(3-LS3-2)
SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. *(3-LS3-1),(3-LS3-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(3-LS3-1),(3-LS3-2)*
MP.4 Model with mathematics. *(3-LS3-1),(3-LS3-2)*
3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. *(3-LS3-1),(3-LS3-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-LS4 Biological Evolution: Unity and Diversity

3-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence. (3-LS4-3)
- Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *(secondary to 3-LS4-4)*

LS4.A: Evidence of Common Ancestry and Diversity

- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(Note: moved from K-2)* (3-LS4-1)
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2),(3-LS4-3)

Scale, Proportion, and Quantity

- Observable phenomena exist from very short to very long time periods. (3-LS4-1)

Systems and System Models

- A system can be described in terms of its components and their interactions. (3-LS4-4)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (3-LS4-1)

Connections to other DCIs in third grade: **3.LS4.C** (3-LS4-2); **3.ESS2.D** (3-LS4-3); **3.ESS3.B** (3-LS4-4)

Articulation of DCIs across grade-levels: **K.ESS3.A** (3-LS4-3)(3-LS4-4); **K.ETS1.A** (3-LS4-4); **1.LS3.A** (3-LS4-2); **2.LS2.A** (3-LS4-3),(3-LS4-4); **2.LS4.D** (3-LS4-3),(3-LS4-4); **4.ESS1.C** (3-LS4-1); **4.ESS3.B** (3-LS4-4); **4.ETS1.A** (3-LS4-4); **MS.LS2.A** (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4); **MS.LS2.C** (3-LS4-4); **MS.LS3.B** (3-LS4-2); **MS.LS4.A** (3-LS4-1); **MS.LS4.B** (3-LS4-2),(3-LS4-3); **MS.LS4.C** (3-LS4-3),(3-LS4-4); **MS.ESS1.C** (3-LS4-1),(3-LS4-3),(3-LS4-4); **MS.ESS2.B** (3-LS4-1); **MS.ESS3.C** (3-LS4-4)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-LS4-1),(3-LS4-2),(3-LS4-3) (3-LS4-4)*

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3LS4-4)*

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)*

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. *(3-LS4-1)*,(3-LS4-3),*(3-LS4-4)*

W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. *(3-LS4-1)*,(3-LS4-2),*(3-LS4-3),(3-LS4-4)*

W.3.9 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1)

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. *(3-LS4-2),(3-LS4-3),(3-LS4-4)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)*

MP.4 Model with mathematics. *(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)*

MP.5 Use appropriate tools strategically. *(3-LS4-1)*

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *(3-LS4-2),(3-LS4-3)*

3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. *(3-LS4-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-ESS2 Earth's Systems

3-ESS2 Earth's Systems

Students who demonstrate understanding can:

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data at this grade level could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in tables and various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (3-ESS2-1)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **K.ESS2.D** (3-ESS2-1); **4.ESS2.A** (3-ESS2-1); **5.ESS2.A** (3-ESS2-1); **MS.ESS2.C** (3-ESS2-1),(3-ESS2-2); **MS.ESS2.D** (3-ESS2-1),(3-ESS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. *(3-ESS2-2)*

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)

W.3.9 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (3-ESS2-1),(3-ESS2-2)

MP.4 Model with mathematics. (3-ESS2-1),(3-ESS2-2)

MP.5 Use appropriate tools strategically. *(3-ESS2-1)*

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-ESS2-1)*

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-ESS3 Earth and Human Activity

3-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*

[Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lighting rods.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1)	**ESS3.B: Natural Hazards** ▪ A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) *(Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)*	**Cause and Effect** ▪ Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1) -- ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** ▪ Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1) -- ***Connections to Nature of Science*** **Science is a Human Endeavor** ▪ Science affects everyday life. (3-ESS3-1)

Connections to other DCIs in third grade: N/A

Articulation of DCIs across grade-levels: **K.ESS3.B** (3-ESS3-1); **K.ETS1.A** (3-ESS3-1); **4.ESS3.B** (3-ESS3-1); **4.ETS1.A** (3-ESS3-1); **MS.ESS3.B** (3-ESS3-1)

Common Core State Standards Connections:

ELA/Literacy –

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. *(3-ESS3-1)*

W.3.7 Conduct short research projects that build knowledge about a topic. *(3-ESS3-1)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(3-ESS3-1)*

MP.4 Model with mathematics. *(3-ESS3-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

Fourth Grade

The performance expectations in fourth grade help students formulate answers to questions such as: "What are waves and what are some things they can do? How can water, ice, wind and vegetation change the land? What patterns of Earth's features can be determined with the use of maps? How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? What is energy and how is it related to motion? How is energy transferred? How can energy be used to solve a problem?" Fourth grade performance expectations include PS3, PS4, LS1, ESS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the *NRC Framework*. Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students are expected to develop understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. Students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

4-PS3 Energy

4-PS3 Energy

Students who demonstrate understanding can:

4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)
- Apply scientific ideas to solve design problems. (4-PS3-4)

Disciplinary Core Ideas

PS3.A: Definitions of Energy
- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3)
- Light also transfers energy from place to place. (4-PS3-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4)

PS3.C: Relationship Between Energy and Forces
- When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3)

PS3.D: Energy in Chemical Processes and Everyday Life
- The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

ETS1.A: Defining Engineering Problems
- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. *(secondary to 4-PS3-4)*

Crosscutting Concepts

Energy and Matter
- Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering and Technology on Society and the Natural World
- Engineers improve existing technologies or develop new ones. (4-PS3-4)

Connections to Nature of Science

Science is a Human Endeavor
- Most scientists and engineers work in teams. (4-PS3-4)
- Science affects everyday life. (4-PS3-4)

Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-levels: **K.PS2.B** (4-PS3-3); **K.ETS1.A** (4-PS3-4); **2.ETS1.B** (4-PS3-4); **3.PS2.A** (4-PS3-3); **5.PS3.D** (4-PS3-4); **5.LS1.C** (4-PS3-4); **MS.PS2.A** (4-PS3-3); **MS.PS2.B** (4-PS3-2); **MS.PS3.A** (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4); **MS.PS3.B** (4-PS3-2),(4-PS3-3),(4-PS3-4); **MS.PS3.C** (4-PS3-3); **MS.PS4.B** (4-PS3-2); **MS.ETS1.B** (4-PS3-4); **MS.ETS1.C** (4-PS3-4)

Common Core State Standards Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. *(4-PS3-1)*

W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2),(4-PS3-3),(4-PS3-4)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1)

Mathematics –

4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. *(4-PS3-4)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-PS4 Waves and their Applications in Technologies for Information Transfer

4-PS4 Waves and their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.* [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1)
- Develop a model to describe phenomena. (4-PS4-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science findings are based on recognizing patterns. (4-PS4-1)

Disciplinary Core Ideas

PS4.A: Wave Properties
- Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. *(Note: This grade band endpoint was moved from K–2.)* (4-PS4-1)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)

PS4.B: Electromagnetic Radiation
- An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)

PS4.C: Information Technologies and Instrumentation
- Digitized information transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3)

ETS1.C: Optimizing The Design Solution
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary to 4-PS4-3)*

Crosscutting Concepts

Patterns
- Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1)
- Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3)

Cause and Effect
- Cause and effect relationships are routinely identified. (4-PS4-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

Connections to other DCIs in fourth grade: **4.PS3.A** (4-PS4-1); **4.PS3.B** (4-PS4-1); **4.ETS1.A** (4-PS4-3)

Articulation of DCIs across grade-levels: **K.ETS1.A** (4-PS4-3); **1.PS4.B** (4-PS4-2); **1.PS4.C** (4-PS4-3); **2.ETS1.B** (4-PS4-3); **2.ETS1.C** (4-PS4-3); **3.PS2.A** (4-PS4-3); **MS.PS4.A** (4-PS4-1); **MS.PS4.B** (4-PS4-2); **MS.PS4.C** (4-PS4-3); **MS.LS1.D** (4-PS4-2); **MS.ETS1.B** (4-PS4-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. *(4-PS4-3)*

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. *(4-PS4-1),(4-PS4-2)*

Mathematics –

MP.4 Model with mathematics. *(4-PS4-1),(4-PS4-2)*

4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. *(4-PS4-1),(4-PS4-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-LS1 From Molecules to Organisms: Structures and Processes

4-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)

Engaging in Argument from Evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).
- Construct an argument with evidence, data, and/or a model. (4-LS1-1)

Disciplinary Core Ideas

LS1.A: Structure and Function
- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

LS1.D: Information Processing
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

Crosscutting Concepts

Systems and System Models
- A system can be described in terms of its components and their interactions. (4-LS1-1),(4-LS1-2)

Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-levels: **1.LS1.A** (4-LS1-1); **1.LS1.D** (4-LS1-2); **3.LS3.B** (4-LS1-1); **MS.LS1.A** (4-LS1-1),(4-LS1-2); **MS.LS1.D** (4-LS1-2)

Common Core State Standards Connections:

ELA/Literacy –

W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. *(4-LS1-2)*

Mathematics –

4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. *(4-LS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS1 Earth's Place in the Universe

4-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with shell fossils above rock layers with plant fossils and no shells, indicating a change from water to land over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ▪ Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	**ESS1.C: The History of Planet Earth** ▪ Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	**Patterns** ▪ Patterns can be used as evidence to support an explanation. (4-ESS1-1) --- ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes consistent patterns in natural systems. (4-ESS1-1)

Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-levels: **2.ESS1.C** (4-ESS1-1); **3.LS4.A** (4-ESS1-1); **MS.LS4.A** (4-ESS1-1); **MS.ESS1.C** (4-ESS1-1) **MS.ESS2.A** (4-ESS1-1); **MS.ESS2.B** (4-ESS1-1)

Common Core State Standards Connections:

ELA/Literacy –

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS1-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(4-ESS1-1)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(4-ESS1-1)*

MP.4 Model with mathematics. *(4-ESS1-1)*

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *(4-ESS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

4-ESS2 Earth's Systems

4-ESS2 Earth's Systems

Students who demonstrate understanding can:

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ▪ Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) **Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ▪ Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)	**ESS2.A: Earth Materials and Systems** ▪ Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** ▪ The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** ▪ Living things affect the physical characteristics of their regions. (4-ESS2-1)	**Patterns** ▪ Patterns can be used as evidence to support an explanation. (4-ESS2-2) **Cause and Effect** ▪ Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

Connections to other DCIs in fourth grade: N/A

Articulation of DCIs across grade-levels: **2.ESS1.C** (4-ESS2-1); **2.ESS2.A** (4-ESS2-1); **2.ESS2.B** (4-ESS2-2); **2.ESS2.C** (4-ESS2-2); **5.ESS2.A** (4-ESS2-1); **5.ESS2.C** (4-ESS2-2); **MS.ESS1.C** (4-ESS2-2); **MS.ESS2.A** (4-ESS2-2); **MS.ESS2.B** (4-ESS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS2-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS2-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. (4-ESS2-1)

MP.4 Model with mathematics. (4-ESS2-1)

MP.5 Use appropriate tools strategically. (4-ESS2-1)

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *(4-ESS2-1)*

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. *(4-ESS2-1),(4-ESS2-2)*

4-ESS3 Earth and Human Activity

4-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas

ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) *(Note: This Disciplinary Core Idea can also be found in 3.WC.)*

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. *(secondary to 4-ESS3-2)*

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

Influence of Science, Engineering and Technology on Society and the Natural World

- Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)
- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

Connections to other DCIs in fourth grade: **4.ETS1.C** (4-ESS3-2)

Articulation of DCIs across grade-levels: **K.ETS1.A** (4-ESS3-2); **2.ETS1.B** (4-ESS3-2); **2.ETS1.C** (4-ESS3-2); **5.ESS3.C** (4-ESS3-1); **MS.PS3.D** (4-ESS3-1); **MS.ESS2.A** (4-ESS3-1),(4-ESS3-2); **MS.ESS3.A** (4-ESS3-1); **MS.ESS3.B** (4-ESS3-2); **MS.ESS3.C** (4-ESS3-1); **MS.ESS3.D** (4-ESS3-1); **MS.ETS1.B** (4-ESS3-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. *(4-ESS3-1)*

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(4-ESS3-1)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(4-ESS3-1),(4-ESS3-2)*

MP.4 Model with mathematics. *(4-ESS3-1),(4-ESS3-2)*

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1),*(4-ESS3-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

Fifth Grade

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1, ESS2, and ESS3 Disciplinary Core Ideas from the *NRC Framework*. Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

5-PS1 Matter and Its Interactions

5-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)
- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. (5-PS1-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (5-PS1-2)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **2.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3); **2.PS1.B** (5-PS1-2),(5-PS1-4); **MS.PS1.A** (5-PS1-1),(5-PS1-2),(5-PS1-3),(5-PS1-4); **MS.PS1.B** (5-PS1-2),(5-PS1-4)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-PS1-1)*

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. *(5-PS1-2),(5-PS1-3),*(5-PS1-4)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(5-PS1-2),(5-PS1-3),*(5-PS1-4)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-PS1-2),(5-PS1-3),(5-PS1-4)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-PS1-1),*(5-PS1-2),(5-PS1-3)

MP.4 Model with mathematics. *(5-PS1-1),*(5-PS1-2),(5-PS1-3)

MP.5 Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)

5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (*5-PS1-1)*

5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (*5-PS1-1)*

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. *(5-PS1-2)*

5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. *(5-PS1-1)*

5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. *(5-PS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS2 Motion and Stability: Forces and Interactions

5-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Support an argument with evidence, data, or a model. (5-PS2-1)	**PS2.B: Types of Interactions** ▪ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)	**Cause and Effect** ▪ Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **3.PS2.A** (5-PS2-1); **3.PS2.B** (5-PS2-1); **MS.PS2.B** (5-PS2-1)**; MS.ESS1.B** (5-PS2-1); **MS.ESS2.C** (5-PS2-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-PS2-1)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-PS3 Energy

5-PS3 Energy		
Students who demonstrate understanding can: **5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ▪ Use models to describe phenomena. (5-PS3-1)	**PS3.D: Energy in Chemical Processes and Everyday Life** ▪ The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1) **LS1.C: Organization for Matter and Energy Flow in Organisms** ▪ Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary to 5-PS3-1)*	**Energy and Matter** ▪ Energy can be transferred in various ways and between objects. (5-PS3-1)
Connections to other DCIs in fifth grade: N/A		
Articulation of DCIs across grade-levels: **K.LS1.C** (5-PS3-1); **2.LS2.A** (5-PS3-1); **4.PS3.A** (5-PS3-1); **4.PS3.B** (5-PS3-1); **4.PS3.D** (5-PS3-1); **MS.PS3.D** (5-PS3-1); **MS.PS4.B** (5-PS3-1); **MS.LS1.C** (5-PS3-1); **MS.LS2.B** (5-PS3-1)		
Common Core State Standards Connections: *ELA/Literacy –* **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-PS3-1)* **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-PS3-1)*		

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-LS1 From Molecules to Organisms: Structures and Processes

5-LS1 From Molecules to Organisms: Structures and Processes		
Students who demonstrate understanding can: **5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.** [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ▪ Support an argument with evidence, data, or a model. (5-LS1-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ▪ Plants acquire their material for growth chiefly from air and water. (5-LS1-1)	**Energy and Matter** ▪ Matter is transported into, out of, and within systems. (5-LS1-1)

Connections to other DCIs in fifth grade: **5.PS1.A** (5-LS1-1)

Articulation of DCIs across grade-levels: **K.LS1.C** (5-LS1-1); **2.LS2.A** (5-LS1-1); **MS.LS1.C** (5-LS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-LS1-1)*

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-LS1-1)*

MP.4 Model with mathematics. *(5-LS1-1)*

MP.5 Use appropriate tools strategically. *(5-LS1-1)*

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. *(5-LS1-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions. ▪ Develop a model to describe phenomena. (5-LS2-1) --- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ Science explanations describe the mechanisms for natural events. (5-LS2-1)	**LS2.A: Interdependent Relationships in Ecosystems** ▪ The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** ▪ Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)	**Systems and System Models** ▪ A system can be described in terms of its components and their interactions. (5-LS2-1)

Connections to other DCIs in fifth grade: **5.PS1.A** (5-LS2-1); **5.ESS2.A** (5-LS2-1)

Articulation of DCIs across grade-levels: **2.PS1.A** (5-LS2-1); **2.LS4.D** (5-LS2-1); **4.ESS2.E** (5-LS2-1); **MS.PS3.D** (5-LS2-1); **MS.LS1.C** (5-LS2-1); **MS.LS2.A** (5-LS2-1); **MS.LS2.B** (5-LS2-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-LS2-1)*

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-LS2-1)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-LS2-1)*

MP.4 Model with mathematics. *(5-LS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5-ESS1 Earth's Place in the Universe

5-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

5-ESS1-1. **Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.** [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]

5-ESS1-2. **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)

Engaging in Argument from Evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).
- Support an argument with evidence, data, or a model. (5-ESS1-1)

Disciplinary Core Ideas

ESS1.A: The Universe and its Stars
- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)

ESS1.B: Earth and the Solar System
- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

Crosscutting Concepts

Patterns
- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)

Scale, Proportion, and Quantity
- Natural objects exist from the very small to the immensely large. (5-ESS1-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **1.ESS1.A** (5-ESS1-2); **1.ESS1.B** (5-ESS1-2); **3.PS2.A** (5-ESS1-2); **MS.ESS1.A** (5-ESS1-1),(5-ESS1-2); **MS.ESS1.B** (5-ESS1-1),(5-ESS1-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-ESS1-1)*
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-ESS1-1)*
RI.5.8 Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). *(5-ESS1-1)*
RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS1-1)
W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)
SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-ESS1-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-ESS1-1),*(5-ESS1-2)
MP.4 Model with mathematics. *(5-ESS1-1),*(5-ESS1-2)
5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. *(5-ESS1-1)*
5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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5-ESS2 Earth's Systems

5-ESS2 Earth's Systems

Students who demonstrate understanding can:

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model using an example to describe a scientific principle. (5-ESS2-1)

Using Mathematics and Computational Thinking
Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

Crosscutting Concepts

Scale, Proportion, and Quantity

- Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-ESS2-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **2.ESS2.A** (5-ESS2-1); **2.ESS2.C** (5-ESS2-2); **3.ESS2.D** (5-ESS2-1); **4.ESS2.A** (5-ESS2-1); **MS.ESS2.A** (5-ESS2-1); **MS.ESS2.C** (5-ESS2-1),(5-ESS2-2); **MS.ESS2.D** (5-ESS2-1); **MS.ESS3.A** (5-ESS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(5-ESS2-1),(5-ESS2-2)*

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (*5-ESS2-2)*

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. *(5-ESS2-1),(5-ESS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-ESS2-1),*(5-ESS2-2)

MP.4 Model with mathematics. *(5-ESS2-1),*(5-ESS2-2)

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. *(5-ESS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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5-ESS3 Earth and Human Activity

5-ESS3 Earth and Human Activity		
Students who demonstrate understanding can: **5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. ▪ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)	**ESS3.C: Human Impacts on Earth Systems** ▪ Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)	**Systems and System Models** ▪ A system can be described in terms of its components and their interactions. (5-ESS3-1) --- ***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World.** ▪ Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **MS.ESS3.A** (5-ESS3-1); **MS.ESS3.C** (5-ESS3-1); **MS.ESS3.D** (5-ESS3-1)

Common Core State Standards Connections:

ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(5-ESS3-1)*

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.(5-ESS3-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(5-ESS3-1)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(5-ESS3-1)*

MP.4 Model with mathematics. *(5-ESS3-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

3-5-ETS1 Engineering Design

3-5-ETS1 Engineering Design

Students who demonstrate understanding can:

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems
- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)

ETS1.B: Developing Possible Solutions
- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)
- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)
- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

Influence of Engineering, Technology, and Science on Society and the Natural World
- People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Connections to 3-5-ETS1.A: Defining and Delimiting Engineering Problems include:
Fourth Grade: 4-PS3-4
Connections to 3-5-ETS1.B: Designing Solutions to Engineering Problems include:
Fourth Grade: 4-ESS3-2
Connections to 3-5-ETS1.C: Optimizing the Design Solution include:
Fourth Grade: 4-PS4-3

Articulation of DCIs across grade-bands: **K-2.ETS1.A** (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3); **K-2.ETS1.B** (3-5-ETS1-2); **K-2.ETS1.C** (3-5-ETS1-2),(3-5-ETS1-3); **MS.ETS1.A** (3-5-ETS1-1); **MS.ETS1.B** (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3); **MS.ETS1.C** (3-5-ETS1-2),(3-5-ETS1-3)

Common Core State Standards Connections:
ELA/Literacy –

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. *(3-5-ETS-2)*
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. *(3-5-ETS-2)*
RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS-2)
W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)
W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. *(3-5-ETS1-1),(3-5-ETS1-3)*
W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. *(3-5-ETS1-1),(3-5-ETS1-3)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)*
MP.4 Model with mathematics. *(3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)*
MP.5 Use appropriate tools strategically. *(3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)*
3-5.OA Operations and Algebraic Thinking *(3-5-ETS1-1),(3-5-ETS1-2)*

Section 11

Next Generation Science Standards

Middle School Storylines & Standards

ONREP

Oregon Natural Resources Education Program

~ connecting educators with forests, wildlife, and water ~

Oregon State Standards, CCSS, and NGSS

Middle School Physical Science

Students in middle school continue to develop understanding of four core ideas in the physical sciences. The middle school performance expectations in the Physical Sciences build on the K – 5 ideas and capabilities to allow learners to explain phenomena central to the physical sciences but also to the life sciences and earth and space science. The performance expectations in physical science blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain real world phenomena in the physical, biological, and earth and space sciences. In the physical sciences, performance expectations at the middle school level focus on students developing understanding of several scientific practices. These include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas. Students are also expected to demonstrate understanding of several of engineering practices including design and evaluation.

The performance expectations in **PS1: Matter and its Interactions** help students to formulate an answer to the question, "How do atomic and molecular interactions explain the properties of matter that we see and feel?" by building understanding of what occurs at the atomic and molecular scale. In middle school, the PS1 Disciplinary Core Idea from the *NRC Framework* is broken down into two sub-ideas: the structure and properties of matter, and chemical reactions. By the end of middle school, students will be able to apply understanding that pure substances have characteristic physical and chemical properties and are made from a single type of atom or molecule. They will be able to provide molecular level accounts to explain states of matters and changes between states, that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. Students are also able to apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. The crosscutting concepts of patterns; cause and effect; scale, proportion and quantity; energy and matter; structure and function; interdependence of science, engineering, and technology; and influence of science, engineering and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the PS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing and interpreting data, designing solutions, and obtaining, evaluating, and communicating information. Students use these scientific and engineering practices to demonstrate understanding of the disciplinary core ideas.

The performance expectations in **PS2: Motion and Stability: Forces and Interactions** focuses on helping students understand ideas related to why some objects will keep moving, why objects fall to the ground and why some materials are attracted to each other while others are not. Students answer the question, "How can one describe physical interactions between objects and within systems of objects?" At the middle school level, the PS2 Disciplinary Core Idea from the *NRC Framework* is broken down into two sub-ideas: Forces and Motion and Types of interactions. By the end of middle school, students will be able to apply Newton's Third Law of Motion to relate forces to explain the motion of objects. Students also apply ideas about gravitational, electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while others repel. In particular, students will develop understanding that gravitational interactions are always attractive but that electrical and magnetic forces can be both attractive and negative. Students also develop ideas that objects can exert forces on each other even though the objects are not in contact, through fields. Students are also able to apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of cause and effect; system and system models; stability and change; and the influence of science, engineering, and technology on society and the natural world serve as organizing concepts for these disciplinary core ideas. In the PS2 performance expectations, students are expected to demonstrate proficiency in asking questions, planning and carrying out investigations, and designing solutions, and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **PS3: Energy** help students formulate an answer to the question, "How can energy be transferred from one object or system to another?" At the middle school level, the PS3 Disciplinary Core Idea from the *NRC Framework* is broken down into four sub-core ideas: Definitions of Energy, Conservation of Energy and Energy Transfer, the Relationship between Energy and Forces, and Energy in Chemical Process and Everyday Life. Students develop their understanding of important qualitative ideas about energy including that the interactions of objects can be explained and predicted using the concept of transfer of energy from one object or system of objects to another, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students will also come to know the difference between energy and temperature, and begin to develop an understanding of the relationship between force and energy. Students are also able to apply an understanding of design to the process of energy transfer. The crosscutting concepts of scale, proportion, and quantity; systems and system models; and energy are called out as organizing concepts for these disciplinary core ideas. The performance expectations in PS3 expect students to demonstrate proficiency in developing and using models, planning investigations, analyzing and interpreting data, and designing solutions, and engaging in argument from evidence; and to use these practices to demonstrate understanding of the core ideas in PS3.

The performance expectations in **PS4: Waves and Their Applications in Technologies for Information Transfer** help students formulate an answer to the question, "What are the characteristic properties of waves and how can they be used?" At the middle school level, the PS4 Disciplinary Core Idea from the *NRC Framework* is broken down into Wave Properties, Electromagnetic Radiation, and Information Technologies and Instrumentation. Students are able to describe and predict characteristic properties and behaviors of waves when the waves interact with matter. Students can apply an understanding of waves as a means to send digital information. The crosscutting concepts of patterns and structure and function are used as organizing concepts for these disciplinary core ideas. The performance expectations in PS4 focus on students demonstrating proficiency in developing and using models, using mathematical thinking, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

Middle School Life Science

Students in middle school develop understanding of key concepts to help them make sense of life science. The ideas build upon students' science understanding from earlier grades and from the disciplinary core ideas, science and engineering practices, and crosscutting concepts of other experiences with physical and earth sciences. There are four life science disciplinary core ideas in middle school: *1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics, 3) Heredity: Inheritance and Variation of Traits, 4) Biological Evolution: Unity and Diversity*. The performance expectations in middle school blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. While the performance expectations in middle school life science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many science and engineering practices integrated in the performance expectations.

The performance expectations in **LS1: *From Molecules to Organisms: Structures and Processes*** help students formulate an answer to the question, "How can one explain the ways cells contribute to the function of living organisms." The LS1 Disciplinary Core Idea from the *NRC Framework* is organized into four sub-ideas: Structure and Function, Growth and Development of Organisms, Organization for Matter and Energy Flow in Organisms, and Information Processing. Students can gather information and use this information to support explanations of the structure and function relationship of cells. They can communicate understanding of cell theory. They have a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. The understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell. Students can construct an explanation for how environmental and genetic factors affect growth of organisms. They can connect this to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction. Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for the core ideas about processes of living organisms.

The performance expectations in **LS2: *Interactions, Energy, and Dynamics Relationships in Ecosystems*** help students formulate an answer to the question, "How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?" The LS2 Disciplinary Core Idea is divided into three sub-ideas: Interdependent Relationships in Ecosystems; Cycles of Matter and Energy Transfer in Ecosystems; and Ecosystem Dynamics, Functioning, and Resilience. Students can analyze and interpret data, develop models, and construct arguments and demonstrate a deeper understanding of resources and the cycling of matter and the flow of energy in ecosystems. They can also study patterns of the interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on population. They evaluate competing design solutions for maintaining biodiversity and ecosystem services.

The performance expectations in **LS3: Heredity: Inheritance and Variation of Traits** help students formulate an answer to the question, "How do living organisms pass traits from one generation to the next?" The LS3 Disciplinary Core Idea from the *NRC Framework* includes two sub-ideas: Inheritance of Traits, and Variation of Traits. Students can use models to describe ways gene mutations and sexual reproduction contribute to genetic variation. Crosscutting concepts of cause and effect and structure and function provide students with a deeper understanding of how gene structure determines differences in the functioning of organisms.

The performance expectations in **LS4: Biological Evolution: Unity and Diversity** help students formulate an answer to the question, "How do organisms change over time in response to changes in the environment?" The LS4 Disciplinary Core Idea is divided into four sub-ideas: Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity and Humans. Students can construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They can use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species. They are able to use fossil records and anatomical similarities of the relationships among organisms and species to support their understanding. Crosscutting concepts of patterns and structure and function contribute to the evidence students can use to describe biological evolution.

Middle School Earth and Space Sciences

Students in middle school continue to develop their understanding of the three disciplinary core ideas in the Earth and Space Sciences. The middle school performance expectations in Earth Space Science build on the elementary school ideas and skills and allow middle school students to explain more in-depth phenomena central not only to the earth and space sciences, but to life and physical sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. While the performance expectations shown in middle school earth and space science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

The performance expectations in **ESS1: Earth's Place in the Universe**, help students formulate an answer to questions such as: "What is Earth's place in the Universe, What makes up our solar system and how can the motion of Earth explain seasons and eclipses, and How do people figure out that the Earth and life on Earth have changed through time?" The ESS1 Disciplinary Core Idea from the *NRC Framework* is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the Earth's place in relation to the solar system, Milky Way galaxy, and universe. There is a strong emphasis on a systems approach, using models of the solar *system* to explain astronomical and other observations of the cyclic patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe. Students examine geoscience data in order to understand the processes and events in Earth's history. The crosscutting concepts of patterns, scale, proportion, and quantity, and systems and systems modeling are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing data, and constructing explanations and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS2: Earth's Systems**, help students formulate an answer to questions such as: "How do the materials in and on Earth's crust change over time, How does the movement of tectonic plates impact the surface of Earth, How does water influence weather, circulate in the oceans, and shape Earth's surface, What factors interact and influence weather, and How have living organisms changed the Earth and how have Earth's changing conditions impacted living organisms?" The ESS2 Disciplinary Core Idea from the *NRC Framework* is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Of special importance in both topics are the ways that geoscience processes provide resources needed by society but also cause natural hazards that present risks to society; both involve technological challenges, for the identification and development of resources. Students develop understanding of the factors that control weather. A systems approach is also important here, examining the feedbacks between systems as energy from the sun is transferred between systems and circulates though the ocean and atmosphere. The crosscutting concepts of patterns, cause and effect, scale proportion and quantity, systems and system models, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS3: Earth and Human Activity** help students formulate an answer to questions such as: "How is the availability of needed natural resources related to naturally occurring processes, How can natural hazards be predicted, How do human activities affect Earth systems, How do we know our global climate is changing?" The ESS3 Disciplinary Core Idea from the *NRC Framework* is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the ways that human activities impacts Earth's other systems. Students use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development. The crosscutting concepts of patterns, cause and effect, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance expectations, students are expected to demonstrate proficiency in asking questions, developing and using models, analyzing and interpreting data, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

Middle School Engineering Design Storylines

By the time students reach middle school they should have had numerous experiences in engineering design. The goal for middle school students is to define problems more precisely, to conduct a more thorough process of choosing the best solution, and to optimize the final design.

Defining the problem with "precision" involves thinking more deeply than is expected in elementary school about the needs a problem is intended to address, or the goals a design is intended to reach. How will the end user decide whether or not the design is successful? Also at this level students are expected to consider not only the end user, but also the broader society and the environment. Every technological change is likely to have both intended and unintended effects. It is up to the designer to try to anticipate the effects it may have, and to behave responsibly in developing a new or improved technology. These considerations may take the form of either criteria or constraints on possible solutions.

Developing possible solutions does not explicitly address generating design ideas since students were expected to develop the capability in elementary school. The focus in middle school is on a two stage process of evaluating the different ideas that have been proposed: by using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising, and by testing different solutions, and then combining the best ideas into new solution that may be better than any of the preliminary ideas.

Improving designs at the middle school level involves an iterative process in which students test the best design, analyze the results, modify the design accordingly, and then re-test and modify the design again. Students may go through this cycle two, three, or more times in order to reach the optimal (best possible) result.

Connections with other science disciplines help students develop these capabilities in various contexts. For example, in the life sciences students apply their engineering design capabilities to evaluate plans for maintaining biodiversity and ecosystem services (MS-LS2-5). In the physical sciences students define and solve problems involving a number of core ideas in physical science, including: chemical processes that release or absorb energy (MS-PS1-6), Newton's third law of motion (MS-PS2-1), and energy transfer (MS-PS3-3). In the Earth and space sciences students apply their engineering design capabilities to problems related the impacts of humans on Earth systems (MS-ESS3-3).

By the end of 8th grade students are expected to achieve all four performance expectations (MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4) related to a single problem in order to understand the interrelated processes of engineering design. These include defining a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment, systematically evaluating alternative solutions, analyzing data from tests of different solutions and combining the best ideas into an improved solution, and developing a model and iteratively testing and improving it to reach an optimal solution. While the performance expectations shown in Middle School Engineering Design couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

MS-PS1 Matter and Its Interactions

MS-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)
- Develop a model to describe unobservable mechanisms. (MS-PS1-5)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.
- 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. (MS-PS1-3)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science knowledge is based upon logical and conceptual connections between evidence and

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3)
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)

PS1.B: Chemical Reactions
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)
- The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)
- Some chemical reactions release energy, others store energy. (MS-PS1-6)

PS3.A: Definitions of Energy
- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. *(secondary to MS-PS1-4)*
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends

Crosscutting Concepts

Patterns
- Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

Scale, Proportion, and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

Energy and Matter
- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-PS1-5)
- The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6)

Structure and Function
- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

explanations. (MS-PS1-2) **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)	jointly on the temperature, the total number of atoms in the system, and the state of the material. *(secondary to MS-PS1-4)* **ETS1.B: Developing Possible Solutions** ▪ A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. *(secondary to MS-PS1-6)* **ETS1.C: Optimizing the Design Solution** ▪ Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. *(secondary to MS-PS1-6)* ▪ The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. *(secondary to MS-PS1-6)*	resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

Connections to other DCIs in this grade-band: **MS.PS3.D** (MS-PS1-2),(MS-PS1-6); **MS.LS1.C** (MS-PS1-2),(MS-PS1-5); **MS.LS2.A** (MS-PS1-3); **MS.LS2.B** (MS-PS1-5); **MS.LS4.D** (MS-PS1-3); **MS.ESS2.A** (MS-PS1-2),(MS-PS1-5); **MS.ESS2.C** (MS-PS1-1),(MS-PS1-4); **MS.ESS3.A** (MS-PS1-3); **MS.ESS3.C** (MS-PS1-3)

Articulation across grade-bands: **5.PS1.A** (MS-PS1-1); **5.PS1.B** (MS-PS1-2),(MS-PS1-5); **HS.PS1.A** (MS-PS1-1),(MS-PS1-3),(MS-PS1-4),(MS-PS1-6); **HS.PS1.B** (MS-PS1-2),(MS-PS1-4),(MS-PS1-5),(MS-PS1-6); **HS.PS3.A** (MS-PS1-4),(MS-PS1-6); **HS.PS3.B** (MS-PS1-6); **HS.PS3.D** (MS-PS1-6); **HS.LS2.A** (MS-PS1-3); **HS.LS4.D** (MS-PS1-3); **HS.ESS1.A** (MS-PS1-1); **HS.ESS3.A** (MS-PS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions *(MS-PS1-2)*,(MS-PS1-3)
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
RST.6-8.7	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). *(MS-PS1-1)*,(MS-PS1-2),*(MS-PS1-4),(MS-PS1-5)*
WHST.6-8.7	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. (MS-PS1-6)
WHST.6-8.8	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. (MS-PS1-3)

Mathematics –

MP.2	Reason abstractly and quantitatively. (MS-PS1-1),(MS-PS1-2),(MS-PS1-5)
MP.4	Model with mathematics. *(MS-PS1-1)*,(MS-PS1-5)
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-PS1-1),(MS-PS1-2)*,(MS-PS1-5)
6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS1-4)
8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *(MS-PS1-1)*
6.SP.B.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots. *(MS-PS1-2)*
6.SP.B.5	Summarize numerical data sets in relation to their context (MS-PS1-2)

MS-PS2 Motion and Stability: Forces and Interactions

MS-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

- Ask questions 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. (MS-PS2-3)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- 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. (MS-PS2-2)
- Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1)

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.

- Construct and present oral and written arguments 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. (MS-PS2-4)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS2-2),(MS-PS2-4)

Disciplinary Core Ideas

PS2.A: Forces and Motion

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)

PS2.B: Types of Interactions

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2-3),(MS-PS2-5)

Systems and System Models

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1),(MS-PS2-4),

Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)

Connections to other DCIs in this grade-band: **MS.PS3.A** (MS-PS2-2); **MS.PS3.B** (MS-PS2-2); **MS.PS3.C** (MS-PS2-1); **MS.ESS1.A** (MS-PS2-4); **MS.ESS1.B** (MS-PS2-4); **MS.ESS2.C** (MS-PS2-2),(MS-PS2-4)

Articulation across grade-bands: **3.PS2.A** (MS-PS2-1),(MS-PS2-2); **3.PS2.B** (MS-PS2-3),(MS-PS2-5); **5.PS2.B** (MS-PS2-4); **HS.PS2.A** (MS-PS2-1),(MS-PS2-2); **HS.PS2.B** (MS-PS2-3),(MS-PS2-4),(MS-PS2-5); **HS.PS3.A** (MS-PS2-5); **HS.PS3.B** (MS-PS2-2),(MS-PS2-5); **HS.PS3.C** (MS-PS2-5); **HS.ESS1.B** (MS-PS2-2),(MS-PS2-4)

Common Core State Standards Connections:

ELA/Literacy –

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions *(MS-PS2-1),(MS-PS2-3)*
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. *(MS-PS2-1),(*MS-PS2-2)*,(MS-PS2-5)*
WHST.6-8.1	Write arguments focused on *discipline-specific content*. (MS-PS2-4)
WHST.6-8.7	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. *(MS-PS2-1),*(MS-PS2-2),*(MS-PS2-5)*
Mathematics –	
MP.2	Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3)
6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-PS2-1)
6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers. *(MS-PS2-1),(MS-PS2-2)*
7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *(MS-PS2-1),(MS-PS2-2)*
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. *(MS-PS2-1),(MS-PS2-2)*

MS-PS3 Energy

MS-PS3 Energy

Students who demonstrate understanding can:

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to describe unobservable mechanisms. (MS-PS3-2)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.
- 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. (MS-PS3-4)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed worlds.
- Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-4),(MS-PS3-5)

Disciplinary Core Ideas

PS3.A: Definitions of Energy
- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)
- Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS3.B: Conservation of Energy and Energy Transfer
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)
- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4)
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3)

PS3.C: Relationship Between Energy and Forces
- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

ETS1.A: Defining and Delimiting an Engineering Problem
- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. *(secondary to MS-PS3-3)*

ETS1.B: Developing Possible Solutions
- A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. *(secondary to MS-PS3-3)*

Crosscutting Concepts

Scale, Proportion, and Quantity
- Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1),(MS-PS3-4)

Systems and System Models
- Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2)

Energy and Matter
- Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5)
- The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3)

Connections to other DCIs in this grade-band: **MS.PS1.A** (MS-PS3-4); **MS.PS1.B** (MS-PS3-3); **MS.PS2.A** (MS-PS3-1),(MS-PS3-4),(MS-PS3-5); **MS.ESS2.A** (MS-PS3-3); **MS.ESS2.C** (MS-PS3-3),(MS-PS3-4); **MS.ESS2.D** (MS-PS3-3),(MS-PS3-4); **MS.ESS3.D** (MS-PS3-4)

Articulation across grade-bands: **4.PS3.B** (MS-PS3-1),(MS-PS3-3); **4.PS3.C** (MS-PS3-4),(MS-PS3-5); **HS.PS1.B** (MS-PS3-4); **HS.PS2.B** (MS-PS3-2); **HS.PS3.A** (MS-PS3-1),(MS-PS3-4),(MS-PS3-5); **HS.PS3.B** (MS-PS3-1),(MS-PS3-2),(MS-PS3-3),(MS-PS3-4),(MS-PS3-5); **HS.PS3.C** (MS-PS3-2)

Common Core State Standards Connections:

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

ELA/Literacy –	
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions *(MS-PS3-1),(MS-PS3-5)*
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. *(MS-PS3-3),*(MS-PS3-4*)*
RST.6-8.7	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). (MS-PS3-1)
WHST.6-8.1	Write arguments focused on discipline content. *(MS-PS3-5)*
WHST.6-8.7	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. (MS-PS3-3)*,(MS-PS3-4)*
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS3-2)*
Mathematics –	
MP.2	Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-4),(MS-PS3-5)
6.RP.A.1	Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),*(MS-PS3-5)*
6.RP.A.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *(MS-PS3-1)*
7.RP.A.2	Recognize and represent proportional relationships between quantities. (MS-PS3-1),*(MS-PS3-5)*
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1)
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. *(MS-PS3-1)*
8.F.A.3	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),*(MS-PS3-5)*
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-PS3-4)*

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]

MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-PS4-2)

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods.

- Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-1)

Disciplinary Core Ideas

PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)
- A sound wave needs a medium through which it is transmitted. (MS-PS4-2)

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2)
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)

PS4.C: Information Technologies and Instrumentation

- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)

Crosscutting Concepts

Patterns

- Graphs and charts can be used to identify patterns in data. (MS-PS4-1)

Structure and Function

- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2)
- Structures can be designed to serve particular functions. (MS-PS4-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3)

Connections to Nature of Science

Science is a Human Endeavor

- Advances in technology influence the progress of science and science has influenced advances in technology. (MS-PS4-3)

Connections to other DCIs in this grade-band: **MS.LS1.D** (MS-PS4-2)

Articulation across grade-bands: **4.PS3.A** (MS-PS4-1); **4.PS3.B** (MS-PS4-1); **4.PS4.A** (MS-PS4-1); **4.PS4.B** (MS-PS4-2); **4.PS4.C** (MS-PS4-3); **HS.PS4.A** (MS-PS4-1),(MS-PS4-2),(MS-PS4-3); **HS.PS4.B** (MS-PS4-1),(MS-PS4-2); **HS.PS4.C** (MS-PS4-3); **HS.ESS1.A** (MS-PS4-2); **HS.ESS2.A** (MS-PS4-2); **HS.ESS2.C** (MS-PS4-2); **HS.ESS2.D** (MS-PS4-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)
RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. *(MS-PS4-3)*
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS4-1),(MS-PS4-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (MS-PS4-1)
MP.4	Model with mathematics. (MS-PS4-1)
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1)
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1)
7.RP.A.2	Recognize and represent proportional relationships between quantities. (MS-PS4-1)
8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *(MS-PS4-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS1 From Molecules to Organisms: Structures and Processes

MS-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living cells, and understanding that living things may be made of one cell or many and varied cells.]

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS1-2)
- Develop a model to describe unobservable mechanisms. (MS-LS1-7)

Planning and Carrying Out Investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- 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. (MS-LS1-5),(MS-LS1-6)

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing

Disciplinary Core Ideas

LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.B: Growth and Development of Organisms

- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5)

Scale, Proportion, and Quantity

- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)

Systems and System Models

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. (MS-LS1-2)

Connections to Engineering, Technology, and Applications of Science

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)
- Use 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. (MS-LS1-4)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- 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. (MS-LS1-8)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

LS1.D: Information Processing

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

PS3.D: Energy in Chemical Processes and Everyday Life

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. *(secondary to MS-LS1-6)*
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. *(secondary to MS-LS1-7)*

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)

Connections to Nature of Science

Science is a Human Endeavor

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

Connections to other DCIs in this grade-band: **MS.PS1.B** (MS-LS1-6),(MS-LS1-7); **MS.LS2.A** (MS-LS1-4),(MS-LS1-5); **MS.LS3.A** (MS-LS1-2); **MS.ESS2.A** (MS-LS1-6)

Articulation to DCIs across grade-bands: **3.LS1.B** (MS-LS1-4),(MS-LS1-5); **3.LS3.A** (MS-LS1-5); **4.LS1.A** (MS-LS1-2); **4.LS1.D** (MS-LS1-8); **5.PS3.D** (MS-LS1-6),(MS-LS1-7); **5.LS1.C** (MS-LS1-6),(MS-LS1-7); **5.LS2.A** (MS-LS1-6); **5.LS2.B** (MS-LS1-6),(MS-LS1-7); **HS.PS1.B** (MS-LS1-6),(MS-LS1-7); **HS.LS1.A** (MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-8); **HS.LS1.C** (MS-LS1-6),(MS-LS1-7); **HS.LS2.A** (MS-LS1-4),(MS-LS1-5); **HS.LS2.B** (MS-LS1-6),(MS-LS1-7); **HS.LS2.D** (MS-LS1-4); **HS.ESS2.D** (MS-LS1-6)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3),(MS-LS1-4),(MS-LS1-5),(MS-LS1-6)
RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. *(MS-LS1-5),(MS-LS1-6)*
RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3),(MS-LS1-4)
WHST.6-8.1	Write arguments focused on discipline content. (MS-LS1-3),(MS-LS1-4)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. *(MS-LS1-5),*(MS-LS1-6)
WHST.6-8.7	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. (MS-LS1-1)
WHST.6-8.8	Gather relevant information from 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. (MS-LS1-8)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5),(MS-LS1-6)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-LS1-2),(MS-LS1-7)*

Mathematics –

6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *(MS-LS1-1),(MS-LS1-2),(MS-LS1-3),(MS-LS1-6)*
6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. *(MS-LS1-4),(MS-LS1-5)*
6.SP.B.4	Summarize numerical data sets in relation to their context. *(MS-LS1-4),(MS-LS1-5)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to describe phenomena. (MS-LS2-3)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
- Construct 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. (MS-LS2-4)
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems
- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
- Food webs are models that demonstrate how matter and energy is transferred between producers~~,~~ consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

LS4.D: Biodiversity and Humans
- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (*secondary to MS-LS2-5*)

ETS1.B: Developing Possible Solutions
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. *(secondary to MS-LS2-5)*

Crosscutting Concepts

Patterns
- Patterns can be used to identify cause and effect relationships. (MS-LS2-2)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

Energy and Matter
- The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

Stability and Change
- Small changes in one part of a system might cause large changes in another part. (MS-LS2-4),(MS-LS2-5)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World
- The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-LS2-5)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)

Science Addresses Questions About the Natural and Material World
- Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-LS2-5)

Connections to other DCIs in this grade-band: **MS.PS1.B** (MS-LS2-3); **MS.LS1.B** (MS-LS2-2); **MS.LS4.C** (MS-LS2-4); **MS.LS4.D** (MS-LS2-4); **MS.ESS2.A** (MS-LS2-3),(MS-LS2-4); **MS.ESS3.A** (MS-LS2-1),(MS-LS2-4); **MS.ESS3.C** (MS-LS2-1),(MS-LS2-4),(MS-LS2-5)

Articulation across grade-bands: **1.LS1.B** (MS-LS2-2); **3.LS2.C** (MS-LS2-1),(MS-LS2-4); **3.LS4.D** (MS-LS2-1),(MS-LS2-4); **5.LS2.A** (MS-LS2-1),(MS-LS2-3); **5.LS2.B** (MS-LS2-3); **HS.PS3.B** (MS-LS2-3); **HS.LS1.C** (MS-LS2-3); **HS.LS2.A** (MS-LS2-1),(MS-LS2-2),(MS-LS2-5); **HS.LS2.B** (MS-LS2-2),(MS-LS2-3); **HS.LS2.C** (MS-LS2-4),(MS-LS2-5); **HS.LS2.D** (MS-LS2-2); **HS.LS4.C** (MS-LS2-1),(MS-LS2-4); **HS.LS4.D** (MS-LS2-1),(MS-LS2-4),(MS-LS2-5); **HS.ESS2.A** (MS-LS2-3); **HS.ESS2.E** (MS-LS2-4); **HS.ESS3.A** (MS-LS2-1),(MS-LS2-5); **HS.ESS3.B** (MS-LS2-4); **HS.ESS3.C** (MS-LS2-4),(MS-LS2-5); **HS.ESS3.D** (MS-LS2-5)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2),(MS-LS2-4)
RST.6-8.7	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). (MS-LS2-1)
RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)
RI.8.8	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS-4),(MS-LS2-5)
WHST.6-8.1	Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)
WHST.6-8.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4)
SL.8.1	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. *(MS-LS2-2)*
SL.8.4	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. *(MS-LS2-2)*
SL.8.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-LS2-3)*

Mathematics –

MP.4	Model with mathematics. *(MS-LS2-5)*
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems. *(MS-LS2-5)*
6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *(MS-LS2-3)*
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-LS2-2)*

MS-LS3 Heredity: Inheritance and Variation of Traits

MS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)*

LS3.A: Inheritance of Traits

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural and designed structures/systems can be analyzed to determine how they function. (MS-LS3-1)

Connections to other DCIs in this grade-band: **MS.LS1.A** (MS-LS3-1); **MS.LS4.A** (MS-LS3-1)

Articulation across grade-bands: **3.LS3.A** (MS-LS3-1),(MS-LS3-2); **3.LS3.B** (MS-LS3-1),(MS-LS3-2); **HS.LS1.A** (MS-LS3-1); **HS.LS1.B** (MS-LS3-1),(MS-LS3-2); **HS.LS3.A** (MS-LS3-1),(MS-LS3-2); **HS.LS3-B** (MS-LS3-1),(MS-LS3-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. *(MS-LS3-1),(MS-LS3-2)*

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. *(MS-LS3-1),(MS-LS3-2)*

RST.6-8.7 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). (MS-LS3-1),(MS-LS3-2)

SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-LS3-1),(MS-LS3-2)*

Mathematics –

MP.4 Model with mathematics. *(MS-LS3-2)*

6.SP.B.5 Summarize numerical data sets in relation to their context. *(MS-LS3-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

MS-LS4 Biological Evolution: Unity and Diversity

MS-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)
- Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)
- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- 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. (MS-LS4-5)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
- In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

Crosscutting Concepts

Patterns

- Patterns can be used to identify cause and effect relationships. (MS-LS4-2)
- Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4-3)

Cause and Effect

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)

Science Addresses Questions About the Natural and Material World

- Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-LS4-5)

Connections to other DCIs in this grade-band: **MS.LS2.A** (MS-LS4-4),(MS-LS4-6); **MS.LS2.C** (MS-LS4-6); **MS.LS3.A** (MS-LS4-2),(MS-LS4-4); **MS.LS3.B** (MS-LS4-2),(MS-LS4-4),(MS-LS4-6); **MS.ESS1.C** (MS-LS4-1),(MS-LS4-2),(MS-LS4-6); **MS.ESS2.B** (MS-LS4-1)

Articulation across grade-bands: **3.LS3.B** (MS-LS4-4); **3.LS4.A** (MS-LS4-1),(MS-LS4-2); **3. LS4.B** (MS-LS4-4); **3.LS4.C** (MS-LS4-6); **HS.LS2.A** (MS-LS4-4),(MS-LS4-6); **HS.LS2.C** (MS-LS4-6); **HS.LS3.B** (MS-LS4-4),(MS-LS4-5),(MS-LS4-6); **HS.LS4.A** (MS-LS4-1),(MS-LS4-2),(MS-LS4-3); **HS.LS4.B** (MS-LS4-4),(MS-LS4-6); **HS.LS4.C** (MS-LS4-4),(MS-LS4-

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

5),(MS-LS4-6); **HS.ESS1.C** (MS-LS4-1),(MS-LS4-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions *(MS-LS4-1),*(MS-LS4-2),*(MS-LS4-3),(MS-LS4-4),*(MS-LS4-5)
RST.6-8.7	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). (MS-LS4-1),(MS-LS4-3)
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. *(MS-LS4-3),(MS-LS4-4)*
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)
WHST.6-8.8	Gather relevant information from 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. *(MS-LS4-5)*
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)
SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. *(MS-LS4-2),(MS-LS4-4)*
SL.8.4	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. *(MS-LS4-2),(MS-LS4-4)*

Mathematics –

MP.4	Model with mathematics. (MS-LS4-6)
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *(MS-LS4-4),(MS-LS4-6)*
6.SP.B.5	Summarize numerical data sets in relation to their context. *(MS-LS4-4),(MS-LS4-6)*
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *(MS-LS4-1),(MS-LS4-2)*
7.RP.A.2	Recognize and represent proportional relationships between quantities. *(MS-LS4-4),(MS-LS4-6)*

MS-ESS1 Earth's Place in the Universe

MS-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as their school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- 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. (MS-ESS1-4)

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars
- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3)
- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

ESS1.C: The History of Planet Earth
- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)

Crosscutting Concepts

Patterns
- Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1)

Scale, Proportion, and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3),(MS-ESS1-4)

Systems and System Models
- Models can be used to represent systems and their interactions. (MS-ESS1-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2)

Connections to other DCIs in this grade-band: **MS.PS2.A** (MS-ESS1-1),(MS-ESS1-2); **MS.PS2.B** (MS-ESS1-1),(MS-ESS1-2); **MS.LS4.A** (MS-ESS1-4); **MS.LS4.C** (MS-ESS1-4); **MS.ESS2.A** (MS-ESS1-3)

Articulation of DCIs across grade-bands: **3.PS2.A** (MS-ESS1-1),(MS-ESS1-2); **3.LS4.A** (MS-ESS1-4); **3.LS4.C** (MS-ESS1-4); **3.LS4.D** (MS-ESS1-4); **4.ESS1.C** (MS-ESS1-4); **5.PS2.B** (MS-ESS1-1),(MS-ESS1-2); **5.ESS1.A** (MS-ESS1-2); **5.ESS1.B** (MS-ESS1-1),(MS-ESS1-2),(5-ESS1-3); **HS.PS1.C** (MS-ESS1-4); **HS.PS2.A** (MS-ESS1-1),(MS-ESS1-2); **HS.PS2.B** (MS-ESS1-1),(MS-ESS1-2); **HS.LS4.A** (MS-ESS1-4); **HS.LS4.C** (MS-ESS1-4); **HS.ESS1.A** (MS-ESS1-2); **HS.ESS1.B** (MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3); **HS.ESS1.C** (MS-ESS1-4); **HS.ESS2.A** (MS-ESS1-3),(MS-ESS1-4)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3),(MS-ESS1-4)
RST.6-8.7	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). (MS-ESS1-3)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4)
SL.8.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-ESS1-1),(MS-ESS1-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (MS-ESS1-3)
MP.4	Model with mathematics. *(MS-ESS1-1),(MS-ESS1-2)*
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *(MS-ESS1-1),(MS-ESS1-2)*,(MS-ESS1-3)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

7.RP.A.2	Recognize and represent proportional relationships between quantities. *(MS-ESS1-1),(MS-ESS1-2),*(MS-ESS1-3)
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *(MS-ESS1-2),(MS-ESS1-4)*
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. *(MS-ESS1-2),(MS-ESS1-4)*

MS-ESS2 Earth's Systems

MS-ESS2 Earth's Systems

Students who demonstrate understanding can:

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop and use a model to describe phenomena. (MS-ESS2-1),(MS-ESS2-6)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Planning and Carrying Out Investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
- 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. (MS-ESS2-5)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- 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 nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)

Connections to Nature of Science

Scientific Knowledge is Open to Revision in Light of New Evidence

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. *(HS.ESS1.C GBE) (secondary to MS-ESS2-3)*

ESS2.A: Earth's Materials and Systems
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

ESS2.D: Weather and Climate
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by

Crosscutting Concepts

Patterns
- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

Scale Proportion and Quantity
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2)

Systems and System Models
- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

Energy and Matter
- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Stability and Change
- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

▪ Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)	absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)	

Connections to other DCIs in this grade-band: **MS.PS1.A** (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-5); **MS.PS1.B** (MS-ESS2-1),(MS-ESS2-2); **MS.PS2.A** (MS-ESS2-5),(MS-ESS2-6); **MS.PS2.B** (MS-ESS2-4); **MS.PS3.A** (MS-ESS2-4),(MS-ESS2-5); **MS.PS3.B** (MS-ESS2-1),(MS-ESS2-5),(MS-ESS2-6); **MS.PS3.D** (MS-ESS2-4); **MS.PS4.B** (MS-ESS2-6); **MS.LS2.B** (MS-ESS2-1),(MS-ESS2-2); **MS.LS2.C** (MS-ESS2-1); **MS.LS4.A** (MS-ESS2-3); **MS.ESS1.B** (MS-ESS2-1); **MS.ESS3.C** (MS-ESS2-1)

Articulation of DCIs across grade-bands: **3.PS2.A** (MS-ESS2-4),(MS-ESS2-6); **3.LS4.A** (MS-ESS2-3); **3.ESS2.D** (MS-ESS2-5),(MS-ESS2-6); **3.ESS3.B** (MS-ESS2-3); **4.PS3.B** (MS-ESS2-1),(MS-ESS2-4); **4.ESS1.C** (MS-ESS2-2),(MS-ESS2-3); **4.ESS2.A** (MS-ESS2-1),(MS-ESS2-2); **4.ESS2.B** (MS-ESS2-3); **4.ESS2.E** (MS-ESS2-2); **4.ESS3.B** (MS-ESS2-3); **5.PS2.B** (MS-ESS2-4); **5.ESS2.A** (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-5),(MS-ESS2-6); **5.ESS2.C** (MS-ESS2-4); **HS.PS1.B** (MS-ESS2-1); **HS.PS2.B** (MS-ESS2-4),(MS-ESS2-6); **HS.PS3.B** (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-6); **HS.PS3.D** (MS-ESS2-2),(MS-ESS2-6); **HS.PS4.B** (MS-ESS2-4); **HS.LS1.C** (MS-ESS2-1); **HS.LS2.B** (MS-ESS2-1),(MS-ESS2-2); **HS.LS4.A** (MS-ESS2-3); **HS.LS4.C** (MS-ESS2-3); **HS.ESS1.B** (MS-ESS2-6); **HS.ESS1.C** (MS-ESS2-2),(MS-ESS2-3); **HS.ESS2.A** (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-4),(MS-ESS2-6); **HS.ESS2.B** (MS-ESS2-2),(MS-ESS2-3); **HS.ESS2.C** (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5); **HS.ESS2.D** (MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5),(MS-ESS2-6); **HS.ESS2.E** (MS-ESS2-1),(MS-ESS2-2); **HS.ESS3.D** (MS-ESS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2),*(MS-ESS2-3)*,(MS-ESS2-5)
RST.6-8.7	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). (MS-ESS2-3)
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3),(MS-ESS2-5)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)
WHST.6-8.8	Gather relevant information from 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. *(MS-ESS2-5)*
SL.8.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-6)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-5)
6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *(MS-ESS2-2),(MS-ESS2-3)*
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. *(MS-ESS2-2),(MS-ESS2-3)*

MS-ESS3 Earth and Human Activity

MS-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarify arguments and models.
- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- 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. (MS-ESS3-1)
- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
- Construct 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. (MS-ESS3-4)

Disciplinary Core Ideas

ESS3.A: Natural Resources
- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

ESS3.B: Natural Hazards
- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)

ESS3.C: Human Impacts on Earth Systems
- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3-4)

ESS3.D: Global Climate Change
- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

Crosscutting Concepts

Patterns
- Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)

Cause and Effect
- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1),(MS-ESS3-4)

Stability and Change
- Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World
- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1),(MS-ESS3-4)
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World
- Science knowledge can describe consequences of actions but does not make the decisions that society takes. (MS-ESS3-4)

Connections to other DCIs in this grade-band: **MS.PS1.A** (MS-ESS3-1); **MS.PS1.B** (MS-ESS3-1); **MS.PS3.A** (MS-ESS3-5); **MS.PS3.C** (MS-ESS3-2); **MS.LS2.A** (MS-ESS3-3),(MS-ESS3-4); **MS.LS2.C** (MS-ESS3-3),(MS-ESS3-4); **MS.LS4.D** (MS-ESS3-3),(MS-ESS3-4); **MS.ESS2.D** (MS-ESS3-1)

Articulation of DCIs across grade-bands: **3.LS2.C** (MS-ESS3-3),(MS-ESS3-4); **3.LS4.D** (MS-ESS3-3),(MS-ESS3-4); **3.ESS3.B** (MS-ESS3-2); **4.PS3.D** (MS-ESS3-1); **4.ESS3.A** (MS-ESS3-1); **4.ESS3.B** (MS-ESS3-2); **5.ESS3.C** (MS-ESS3-3),(MS-ESS3-4); **HS.PS3.B** (MS-ESS3-1),(MS-ESS3-5); **HS.PS4.B** (MS-ESS3-5); **HS.LS1.C** (MS-ESS3-1); **HS.LS2.A** (MS-ESS3-4); **HS.LS2.C**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

(MS-ESS3-3),(MS-ESS3-4); **HS.LS4.C** (MS-ESS3-3),(MS-ESS3-4); **HS.LS4.D** (MS-ESS3-3),(MS-ESS3-4); **HS.ESS2.A** (MS-ESS3-1),(MS-ESS3-5); **HS.ESS2.B** (MS-ESS3-1),(MS-ESS3-2); **HS.ESS2.C** (MS-ESS3-1),(MS-ESS3-3); **HS.ESS2.D** (MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-5); **HS.ESS2.E** (MS-ESS3-3),(MS-ESS3-4); **HS.ESS3.A** (MS-ESS3-1),(MS-ESS3-4); **HS.ESS3.B** (MS-ESS3-2); **HS.ESS3.C** (MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5); **HS.ESS3.D** (MS-ESS3-2);(MS-ESS3-3),(MS-ESS3-5)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),*(MS-ESS3-2),*(MS-ESS3-4),(MS-ESS3-5)
RST.6-8.7	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). (MS-ESS3-2)
WHST.6-8.1	Write arguments focused on discipline content. (MS-ESS3-4)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1)
WHST.6-8.7	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. (MS-ESS3-3)
WHST.6-8.8	Gather relevant information from 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. (MS-ESS3-3)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4)

Mathematics –

MP.2	Reason abstractly and quantitatively. (MS-ESS3-2),*(MS-ESS3-5)*
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *(MS-ESS3-3),(MS-ESS3-4)*
7.RP.A.2	Recognize and represent proportional relationships between quantities. *(MS-ESS3-3),(MS-ESS3-4)*
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *(MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)*
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. *(MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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MS-ETS1 Engineering Design

MS-ETS1 Engineering Design

Students who demonstrate understanding can:

MS-ETS1-1. **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**

MS-ETS1-2. **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**

MS-ETS1-3. **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**

MS-ETS1-4. **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarify arguments and models.
- 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. (MS-ETS1-1)

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems
- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)

ETS1.B: Developing Possible Solutions
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution
- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

Crosscutting Concepts

Influence of Science, Engineering, and Technology on Society and the Natural World
- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

Connections to MS-ETS1.A: Defining and Delimiting Engineering Problems include:
Physical Science: MS-PS3-3
Connections to MS-ETS1.B: Developing Possible Solutions Problems include:
Physical Science: MS-PS1-6, MS-PS3-3, **Life Science:** MS-LS2-5
Connections to MS-ETS1.C: Optimizing the Design Solution include:
Physical Science: MS-PS1-6

Articulation of DCIs across grade-bands: **3-5.ETS1.A** (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3); **3-5.ETS1.B** (MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); **3-5.ETS1.C** (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); **HS.ETS1.A** (MS-ETS1-1),(MS-ETS1-2); **HS.ETS1.B** (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4); **HS.ETS1.C** (MS-ETS1-3),(MS-ETS1-4)

Common Core State Standards Connections:

ELA/Literacy –

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),*(MS-ETS1-2),(MS-ETS1-3)*
RST.6-8.7	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). *(MS-ETS1-3)*
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3)
WHST.6-8.7	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. (MS-ETS1-2)
WHST.6-8.8	Gather relevant information from 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. (MS-ETS1-1)
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research. *(MS-ETS1-2)*
SL.8.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. *(MS-ETS1-4)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)*
7.EE.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *(MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)*
7.SP	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. *(MS-ETS1-4)*

Section 12

Next Generation Science Standards

High School Storylines & Standards

Oregon State Standards, CCSS, and NGSS

High School Physical Sciences

Students in high school continue to develop their understanding of the four core ideas in the physical sciences. These ideas include the most fundamental concepts from chemistry and physics, but are intended to leave room for expanded study in upper-level high school courses. The high school performance expectations in Physical Science build on the middle school ideas and skills and allow high school students to explain more in-depth phenomena central not only to the physical sciences, but to life and earth and space sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. In the physical science performance expectations at the high school level, there is a focus on several scientific practices. These include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas. Students are also expected to demonstrate understanding of several engineering practices including design and evaluation.

The performance expectations in **PS1: Matter and its interactions** help students formulate an answer to the question, "How can one explain the structure, properties, and interactions of matter?" The PS1 Disciplinary Core Idea from the *NRC Framework* is broken down into three sub-ideas: the structure and properties of matter, chemical reactions, and nuclear processes. Students are expected to develop understanding of the substructure of atoms and to provide more mechanistic explanations of the properties of substances. Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and the rearrangements of atoms. Students are able to use the periodic table as a tool to explain and predict the properties of elements. Using this expanded knowledge of chemical reactions, students are able to explain important biological and geophysical phenomena. Phenomena involving nuclei are also important to understand, as they explain the formation and abundance of the elements, radioactivity, the release of energy from the sun and other stars, and the generation of nuclear power. Students are also able to apply an understanding of the process of optimization in engineering design to chemical reaction systems. The crosscutting concepts of patterns, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the PS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and conducting investigations, using mathematical thinking, and constructing explanations and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS2: Motion and Stability: Forces and Interactions** support students' understanding of ideas related to why some objects will keep moving, why objects fall to the ground and why some materials are attracted to each other while others are not. Students should be able to answer the question, "How can one explain and predict interactions between objects and within systems of objects?" The disciplinary core idea expressed in the *Framework* for PS2 is broken down into the sub ideas of Forces and Motion and Types of Interactions. The performance expectations in PS2 focus on students building understanding of forces and interactions and Newton's Second Law. Students also develop understanding that the total momentum of a system of objects is conserved when there is no net force on the system. Students are able to use Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Students are able to apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. The crosscutting concepts of patterns, cause and effect, systems and system models, and structure and function are called out as organizing concepts for these disciplinary core ideas. In the PS2 performance expectations, students are expected to demonstrate proficiency in planning and conducting investigations, analyzing data and using math to support claims, applying scientific ideas to solve design problems, and communicating scientific and technical information; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS3: Energy** help students formulate an answer to the question, "How is energy transferred and conserved?" The Core Idea expressed in the *Framework* for PS3 is broken down into four sub-core ideas: Definitions of Energy, Conservation of Energy and Energy Transfer, the Relationship between Energy and Forces, and Energy in Chemical Process and Everyday Life. Energy is understood as quantitative property of a system that depends on the motion and interactions of matter and radiation within that system, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students develop an understanding that energy at both the macroscopic and the atomic scale can be accounted for as either motions of particles or energy associated with the configuration (relative positions) of particles. In some cases, the energy associated with the configuration of particles can be thought of as stored in fields. Students also demonstrate their understanding of engineering principles when they design, build, and refine devices associated with the conversion of energy. The crosscutting concepts of cause and effect; systems and system models; energy and matter; and the influence of science, engineering, and technology on society and the natural world are further developed in the performance expectations associated with PS3. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carry out investigations, using computational thinking and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS4: Waves and Their Applications in Technologies for Information Transfer** are critical to understand how many new technologies work. As such, this core idea helps students answer the question, "How are waves used to transfer energy and send and store information?" The disciplinary core idea in PS4 is broken down into Wave Properties, Electromagnetic Radiation, and Information Technologies and Instrumentation. Students are able to apply understanding of how wave properties and the interactions of electromagnetic radiation with matter can transfer information across long distances, store information, and investigate nature on many scales. Models of electromagnetic radiation as either a wave of changing electric and magnetic fields or as particles are developed and used. Students understand that combining waves of different frequencies can make a wide variety of patterns and thereby encode and transmit information. Students also demonstrate their understanding of engineering ideas by presenting information about how technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. The crosscutting concepts of cause and effect; systems and system models; stability and change; interdependence of science, engineering, and technology; and the influence of engineering, technology, and science on society and the natural world are highlighted as organizing concepts for these disciplinary core ideas. In the PS3 performance expectations, students are expected to demonstrate proficiency in asking questions, using mathematical thinking, engaging in argument from evidence and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

High School Life Sciences

Students in high school develop understanding of key concepts that will help them make sense of life science. The ideas are built upon students' science understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts from earlier grades. There are four life science disciplinary core ideas in high school: *1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics, 3) Heredity: Inheritance and Variation of Traits, 4) Biological Evolution: Unity and Diversity*. The performance expectations for high school life science blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge that can be applied across the science disciplines. While the performance expectations in high school life science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices underlying the performance expectations.

The performance expectations in **LS1: *From Molecules to Organisms: Structures and Processes*** help students formulate an answer to the question, "How do organisms live and grow?" The LS1 Disciplinary Core Idea from the *NRC Framework* is presented as three sub-ideas: Structure and Function, Growth and Development of Organisms, and Organization for Matter and Energy Flow in Organisms. In these performance expectations, students demonstrate that they can use investigations and gather evidence to support explanations of cell function and reproduction. They understand the role of proteins as essential to the work of the cell and living systems. Students can use models to explain photosynthesis, respiration, and the cycling of matter and flow of energy in living organisms. The cellular processes can be used as a model for understanding of the hierarchical organization of organism. Crosscutting concepts of matter and energy, structure and function, and systems and system models provide students with insights to the structures and processes of organisms.

The performance expectations in **LS2*: Ecosystems: Interactions, Energy, and Dynamics*** help students formulate an answer to the question, "How and why do organisms interact with their environment, and what are the effects of these interactions?" The LS2 Disciplinary Core Idea includes four sub-ideas: Interdependent Relationships in Ecosystems, Cycles of Matter and Energy Transfer in Ecosystems, Ecosystem Dynamics, Functioning, and Resilience, and Social Interactions and Group Behavior. High school students can use mathematical reasoning to demonstrate understanding of fundamental concepts of carrying capacity, factors affecting biodiversity and populations, and the cycling of matter and flow of energy among organisms in an ecosystem. These mathematical models provide support of students' conceptual understanding of systems and their ability to develop design solutions for reducing the impact of human activities on the environment and maintaining biodiversity. Crosscutting concepts of systems and system models play a central role in students' understanding of science and engineering practices and core ideas of ecosystems.

The performance expectations in **LS3: Heredity: Inheritance and Variation of Traits** help students formulate answers to the questions: "How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?" The LS3 Disciplinary Core Idea from the *NRC Framework* includes two sub-ideas: Inheritance of Traits, and Variation of Traits. Students are able to ask questions, make and defend a claim, and use concepts of probability to explain the genetic variation in a population. Students demonstrate understanding of why individuals of the same species vary in how they look, function, and behave. Students can explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expression. Crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these core ideas.

The performance expectations in **LS4: Biological Evolution: Unity and Diversity** help students formulate an answer to the question, "What evidence shows that different species are related? The LS4 Disciplinary Core Idea involves four sub-ideas: Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity and Humans. Students can construct explanations for the processes of natural selection and evolution and communicate how multiple lines of evidence support these explanations. Students can evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in populations as those trends relate to advantageous heritable traits in a specific environment. The crosscutting concepts of cause and effect and systems and system models play an important role in students' understanding of the evolution of life on Earth.

High School Earth and Space Sciences

Students in high school continue to develop their understanding of the three disciplinary core ideas in the Earth and Space Sciences. The high school performance expectations in Earth and Space Science build on the middle school ideas and skills and allow high school students to explain more in-depth phenomena central not only to the earth and space sciences, but to life and physical sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. While the performance expectations shown in high school earth and space science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

The performance expectations in **ESS1: Earth's Place in the Universe**, help students formulate an answer to the question: "What is the universe, and what is Earth's place in it?" The ESS1 Disciplinary Core Idea from the *NRC Framework* is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the processes governing the formation, evolution, and workings of the solar system and universe. Some concepts studied are fundamental to science, such as understanding how the matter of our world formed during the Big Bang and within the cores of stars. Others concepts are practical, such as understanding how short-term changes in the behavior of our sun directly affect humans. Engineering and technology play a large role here in obtaining and analyzing the data that support the theories of the formation of the solar system and universe. The crosscutting concepts of patterns, scale, proportion, and quantity, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, using mathematical and computational thinking, constructing explanations and designing solutions, engaging in argument, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS2: Earth's Systems**, help students formulate an answer to the question: "How and why is Earth constantly changing?" The ESS2 Disciplinary Core Idea from the *NRC Framework* is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. For the purpose of the NGSS, biogeology has been addressed within the life science standards. Students develop models and explanations for the ways that feedbacks between different Earth systems control the appearance of Earth's surface. Central to this is the tension between internal systems, which are largely responsible for creating land at Earth's surface, and the sun-driven surface systems that tear down the land through weathering and erosion. Students begin to examine the ways that human activities cause feedbacks that create changes to other systems. Students understand the system interactions that control weather and climate, with a major emphasis on the mechanisms and implications of climate change. Students model the flow of energy between different components of the weather system and how this affects chemical cycles such as the carbon cycle. The crosscutting concepts of cause and effect, energy and matter, structure and function and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS3: Earth and Human Activity** help students formulate an answer to the question: "How do Earth's surface processes and human activities affect each other?" The ESS3 Disciplinary Core Idea from the *NRC Framework* is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the complex and significant interdependencies between humans and the rest of Earth's systems through the impacts of natural hazards, our dependencies on natural resources, and the significant environmental impacts of human activities. Engineering and technology figure prominently here, as students use mathematical thinking and the analysis of geoscience data to examine and construct solutions to the many challenges facing long-term human sustainability on Earth. The crosscutting concepts of cause and effect, systems and system models, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance expectations, students are expected to demonstrate proficiency in developing and using analyzing and interpreting data, mathematical and computational thinking, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

High School Engineering Design Storylines

At the high school level students are expected to engage with major global issues at the interface of science, technology, society and the environment, and to bring to bear the kinds of analytical and strategic thinking that prior training and increased maturity make possible. As in prior levels, these capabilities can be thought of in three stages—defining the problem, developing possible solutions, and improving designs.

Defining the problem at the high school level requires both qualitative and quantitative analysis. For example, the need to provide food and fresh water for future generations comes into sharp focus when considering the speed at which world population is growing, and conditions in countries that have experienced famine. While high school students are not expected to solve these challenges, they are expected to begin thinking about them as problems that can be addressed, at least in part, through engineering.

Developing possible solutions for major global problems begins by breaking them down into smaller problems that can be tackled with engineering methods. To evaluate potential solutions students are expected to not only consider a wide range of criteria, but to also recognize that criteria need to be prioritized. For example, public safety or environmental protection may be more important than cost or even functionality. Decisions on priorities can then guide tradeoff choices.

Improving designs at the high school level may involve sophisticated methods, such as using computer simulations to model proposed solutions. Students are expected to use such methods to take into account a range of criteria and constraints, to try and anticipate possible societal and environmental impacts, and to test the validity of their simulations by comparison to the real world.

Connections with other science disciplines help high school students develop these capabilities in various contexts. For example, in the life sciences students are expected to design, evaluate, and refine a solution for reducing human impact on the environment (HS-LS2-7) and to create or revise a simulation to test solutions for mitigating adverse impacts of human activity on biodiversity (HS-LS4-6). In the physical sciences students solve problems by applying their engineering capabilities along with their knowledge of conditions for chemical reactions (HS-PS1-6), forces during collisions (HS-PS2-3), and conversion of energy from one form to another (HS-PS3-3). In the Earth and space sciences students apply their engineering capabilities to reduce human impacts on Earth systems, and improve social and environmental cost-benefit ratios (HS-ESS3-2, HS-ESS3-4).

By the end of 12th grade students are expected to achieve all four HS-ETS1 performance expectations (HS-ETS1-1, HS-ETS1-2, HS-ETS1-3, and HS-ETS1-4) related to a single problem in order to understand the interrelated processes of engineering design. These include analyzing major global challenges, quantifying criteria and constraints for solutions; breaking down a complex problem into smaller, more manageable problems, evaluating alternative solutions based on prioritized criteria and trade-offs, and using a computer simulation to model the impact of proposed solutions. While the performance expectations shown in High School Engineering Design couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

HS-PS1 Matter and Its Interactions

HS-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* [Clarification Statement: Emphasis is on the application of Le Chatlier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4),(HS-PS1-8)
- Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-3)

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1),(HS-PS1-2)
- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PS1-3),*(secondary to HS-PS2-6)*
- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PS1-4)

PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical

Crosscutting Concepts

Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-5)

Energy and Matter

- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8)
- The total amount of energy and matter in closed systems is conserved. (HS-PS1-7)
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS1-4)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-PS1-6)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS1-7)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

▪ Use mathematical representations of phenomena to support claims. (HS-PS1-7) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. ▪ Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. (HS-PS1-5) ▪ Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-PS1-2) ▪ Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS1-6)	reactions. (HS-PS1-2),(HS-PS1-7) **PS1.C: Nuclear Processes** ▪ Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS-PS1-8) **ETS1.C: Optimizing the Design Solution** ▪ Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS1-6)*	

Connections to other DCIs in this grade-band: **HS.PS3.A** (HS-PS1-4),(HS-PS1-5),(HS-PS1-8); **HS.PS3.B** (HS-PS1-4),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **HS.PS3.C** (HS-PS1-8); **HS.PS3.D** (HS-PS1-4),(HS-PS1-8); **HS.LS1.C** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-7); **HS.LS2.B** (HS-PS1-7); **HS.ESS1.A** (HS-PS1-8); **HS.ESS1.C** (HS-PS1-8); **HS.ESS2.C** (HS-PS1-2),(HS-PS1-3)

Articulation to DCIs across grade-bands: **MS.PS1.A** (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8); **MS.PS1.B** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **MS.PS1.C** (HS-PS1-8); **MS.PS2.B** (HS-PS1-3),(HS-PS1-4),(HS-PS1-5); **MS.PS2.C** (HS-PS1-6); **MS.PS3.A** (HS-PS1-5); **MS.PS3.B** (HS-PS1-5); **MS.PS3.D** (HS-PS1-4); **MS.LS1.C** (HS-PS1-4),(HS-PS1-7); **MS.LS2.B** (HS-PS1-7); **MS.ESS2.A** (HS-PS1-7),(HS-PS1-8)

Common Core State Standards Connections:

ELA/Literacy –

RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. *(HS-PS1-1)*
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-3),(HS-PS1-5)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),*(HS-PS1-5)*
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-PS1-2)
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-3),*(HS-PS1-6)*
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS1-3)
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS1-3)*
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. *(HS-PS1-4)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7)
MP.4	Model with mathematics. *(HS-PS1-4),(HS-PS1-8)*
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),*(HS-PS1-3),(HS-PS1-4),(HS-PS1-5)*,(HS-PS1-7),(HS-PS1-8)
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),*(HS-PS1-7)*,(HS-PS1-8)
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS2 Motion and Stability: Forces and Interactions

HS-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]

HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]

HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]

HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS2-5)

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-PS2-1)

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena to describe explanations. (HS-PS2-2),(HS-PS2-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1)
- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (HS-PS2-2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-2),(HS-PS2-3)

PS2.B: Types of Interactions

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4),(HS-PS2-5)
- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS2-6),*(secondary to HS-PS1-1)*,*(secondary to HS-PS1-3)*

PS3.A: Definitions of Energy

- …and "electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. *(secondary to HS-PS2-5)*

ETS1.A: Defining and Delimiting Engineering Problems

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS2-3)*

ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS2-3)*

Crosscutting Concepts

Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4)

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-1),(HS-PS2-5)
- Systems can be designed to cause a desired effect. (HS-PS2-3)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)

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(including orally, graphically, textually, and mathematically). (HS-PS2-6) --- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ Theories and laws provide explanations in science. (HS-PS2-1),(HS-PS2-4) ▪ Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1),(HS-PS2-4)		

Connections to other DCIs in this grade-band: **HS.PS3.A** (HS-PS2-4),(HS-PS2-5); **HS.PS3.C** (HS-PS2-1); **HS.PS4.B** (HS-PS2-5); **HS.ESS1.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS1.B** (HS-PS2-4); **HS.ESS1.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS2.A** (HS-PS2-5); **HS.ESS2.C** (HS-PS2-1),(HS-PS2-4); **HS.ESS3.A** (HS-PS2-4),(HS-PS2-5)

Articulation to DCIs across grade-bands: **MS.PS1.A** (HS-PS2-6); **MS.PS2.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.PS2.B** (HS-PS2-4),(HS-PS2-5),(HS-PS2-6); **MS.PS3.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.ESS1.B** (HS-PS2-4),(HS-PS2-5)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-PS2-1),(HS-PS2-6)*
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-PS2-1)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS2-6)*
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS2-3),(HS-PS2-5)
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. *(HS-PS2-5)*
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS2-1),(HS-PS2-5)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)
MP.4	Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4)
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)*
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. *(HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5),(HS-PS2-6)*
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)*
HSA-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (HS-PS2-1),(HS-PS2-4)
HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (HS-PS2-1),(HS-PS2-4)
HSA-CED.A.1	Create equations and inequalities in one variable and use them to solve problems. (HS-PS2-1),(HS-PS2-2)
HSA-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-PS2-1),(HS-PS2-2)*
HSA-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS2-1),(HS-PS2-2)*
HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. *(HS-PS2-1)*
HSS-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots). *(HS-PS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS3 Energy

HS-PS3 Energy

Students who demonstrate understanding can:

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS3-2),(HS-PS3-5)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS3-4)

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-PS3-1)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Design, evaluate, and/or refine a solution to a

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1),(HS-PS3-2)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PS3-2) (HS-PS3-3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PS3-1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1),(HS-PS3-4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PS3-1)
- The availability of energy limits what can occur in any system. (HS-PS3-1)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4)

PS3.C: Relationship Between Energy and Forces

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3-5)

PS3.D: Energy in Chemical Processes

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS3-5)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-PS3-4)
- Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (HS-PS3-1)

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS3-3)
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (HS-PS3-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS3-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS3-3)	surrounding environment. (HS-PS3-3),(HS-PS3-4) **ETS1.A: Defining and Delimiting Engineering Problems** ▪ Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS3-3)*	▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS3-1)

Connections to other DCIs in this grade-band: **HS.PS1.A** (HS-PS3-2); **HS.PS1.B** (HS-PS3-1),(HS-PS3-2); **HS.PS2.B** (HS-PS3-2),(HS-PS3-5); **HS.LS2.B** (HS-PS3-1); **HS.ESS1.A** (HS-PS3-1),(HS-PS3-4); **HS.ESS2.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-4); **HS.ESS2.D** (HS-PS3-4); **HS.ESS3.A** (HS-PS3-3)

Articulation to DCIs across grade-bands: **MS.PS1.A** (HS-PS3-2); **MS.PS2.B** (HS-PS3-2),(HS-PS3-5); **MS.PS3.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-3); **MS.PS3.B** (HS-PS3-1),(HS-PS3-3),(HS-PS3-4); **MS.PS3.C** (HS-PS3-2),(HS-PS3-5); **MS.ESS2.A** (HS-PS3-1),(HS-PS3-3)

Common Core State Standards Connections:
ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-PS3-4)*
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. *(HS-PS3-3),* (HS-PS3-4),*(HS-PS3-5)*
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS3-4),*(HS-PS3-5)*
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS3-4),(HS-PS3-5)*
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. *(HS-PS3-1),(HS-PS3-2),(HS-PS3-5)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),(HS-PS3-4),(HS-PS3-5)
MP.4	Model with mathematics. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),*(HS-PS3-4),*(HS-PS3-5)
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS3-1),(HS-PS3-3)
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. (HS-PS3-1),(HS-PS3-3)
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS3-1),(HS-PS3-3)

HS-PS4 Waves and Their Applications in Technologies for Information Transfer

HS-PS4 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information. [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.] [Assessment Boundary: Assessment does not include using quantum theory.]

HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. [Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.]

HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.* [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assesments are limited to qualitative information. Assessments do not include band theory.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. (HS-PS4-2)

Using Mathematics and Computational Thinking

Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-PS4-1)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-PS4-3)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible. (HS-PS4-4)
- Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS4-5)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-PS4-3)

Disciplinary Core Ideas

PS3.D: Energy in Chemical Processes

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. *(secondary to HS-PS4-5)*

PS4.A: Wave Properties

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PS4-1)
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PS4-2),(HS-PS4-5)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PS4-3)

PS4.B: Electromagnetic Radiation

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PS4-3)
- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS-PS4-4)
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PS4-5)

PS4.C: Information Technologies and Instrumentation

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS4-1)
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS4-4)
- Systems can be designed to cause a desired effect. (HS-PS4-5)

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-PS4-3)

Stability and Change

- Systems can be designed for greater or lesser stability. (HS-PS4-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Science and engineering complement each other in the cycle known as research and development (R&D). (HS-PS4-5)

Influence of Engineering, Technology, and Science on Society and the Natural World

- Modern civilization depends on major technological systems. (HS-PS4-2),(HS-PS4-5)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS4-2)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-PS4 Waves and Their Applications in Technologies for Information Transfer

Connections to other DCIs in this grade-band: **HS.PS1.C** (HS-PS4-4); **HS.LS1.C** (HS-PS4-4); **HS.PS3.A** (HS-PS4-4),(HS-PS4-5); **HS.PS3.D** (HS-PS4-3),(HS-PS4-4); **HS.ESS1.A** (HS-PS4-3); **HS.ESS2.A** (HS-PS4-1); **HS.ESS2.D** (HS-PS4-3)	
Articulation to DCIs across grade-bands: **MS.PS3.D** (HS-PS4-4); **MS.PS4.A** (HS-PS4-1),(HS-PS4-2),(HS-PS4-5); **MS.PS4.B** (HS-PS4-1),(HS-PS4-2),(HS-PS4-3),(HS-PS4-4),(HS-PS4-5); **MS.PS4.C** (HS-PS4-2),(HS-PS4-5); **MS.LS1.C** (HS-PS4-4); **MS.ESS2.D** (HS-PS4-4)	
Common Core State Standards Connections:	
ELA/Literacy –	
RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-PS4-2),(HS-PS4-3),(HS-PS4-4)*
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. *(HS-PS4-1),*(HS-PS4-4)
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS4-5)*
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS4-4)
Mathematics –	
MP.2	Reason abstractly and quantitatively. (HS-PS4-1),(HS-PS4-3)
MP.4	Model with mathematics. (HS-PS4-1)
HSA-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. (HS-PS4-1),*(HS-PS4-3)*
HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. *(HS-PS4-1),(HS-PS4-3)*
HSA.CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS4-1),(HS-PS4-3)*

HS-LS1 From Molecules to Organisms: Structures and Processes

HS-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

Planning and Carrying Out Investigations

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

Disciplinary Core Ideas

LS1.A: Structure and Function

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

LS1.B: Growth and Development of Organisms

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

LS1.C: Organization for Matter and Energy Flow in Organisms

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
- As matter and energy flow through different

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

--- ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** ▪ Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3)	organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7) ▪ As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another and release energy to the surrounding environment and to maintain body temperature. Cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. (HS-LS1-7)	

Connections to other DCIs in this grade-band: **HS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

Articulation to DCIs across grade-bands: **MS.PS1.A** (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1),(HS-LS1-6)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1),(HS-LS1-6)
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS1-6)
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS1-3)
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. *(HS-LS1-3)*
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6)
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. *(HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)*

Mathematics –

MP.4	Model with mathematics. *(HS-LS1-4)*
HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. *(HS-LS1-4)*
HSF-BF.A.1	Write a function that describes a relationship between two quantities. *(HS-LS1-4)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and, extreme changes, such as volcanic eruption or sea level rise.]

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8)

Scale, Proportion, and Quantity

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)
- Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

Energy and Matter

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

and will continue to do so in the future. (HS-LS2-3)

- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)
- Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8)

Connections to Nature of Science

Scientific Knowledge is Open to Revision in Light of New Evidence

- Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2),(HS-LS2-3)
- Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8)

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

LS2.D: Social Interactions and Group Behavior

- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(secondary to HS-LS2-7)*
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. *(secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)*

PS3.D: Energy in Chemical Processes

- The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. *(secondary to HS-LS2-5)*

ETS1.B: Developing Possible Solutions

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(secondary to HS-LS2-7)*

Connections to other DCIs in this grade-band: **HS.PS1.B** (HS-LS2-3),(HS-LS2-5); **HS.PS3.B** (HS-LS2-3),(HS-LS2-4); **HS.PS3.D** (HS-LS2-3),(HS-LS2-4); **HS.ESS2.A** (HS-LS2-3); **HS.ESS2.D** (HS-LS2-5),(HS-LS2-7); **HS.ESS2.E** (HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **HS.ESS3.A** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.C** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.D** (HS-LS2-2)

Articulation across grade-bands: **MS.PS1.B** (HS-LS2-3); **MS.PS3.D** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS1.B** (HS-LS2-8); **MS.LS1.C** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.A** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6); **MS.LS2.B** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS2.A** (HS-LS2-5); **MS.ESS2.E** (HS-LS2-6); **MS.ESS3.A** (HS-LS2-1); **MS.ESS3.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS3.D** (HS-LS2-7)

Common Core State Standards Connections:

ELA/Literacy –

RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-LS2-6),*(HS-LS2-7),(HS-LS2-8)*
RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-LS2-1),(HS-LS2-2),*(HS-LS2-3),(HS-LS2-6),(HS-LS2-8)
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. *(HS-LS2-6),(HS-LS2-7),(HS-LS2-8)*
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS2-1),(HS-LS2-2),*(HS-LS2-3)
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS2-3)
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS2-7)

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),*(HS-LS2-7)*
MP.4	Model with mathematics. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4)*
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)*
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)*
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)*
HSS-ID.A.1	Represent data with plots on the real number line. *(HS-LS2-6)*
HSS-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population. *(HS-LS2-6)*
HSS-IC.B.6	Evaluate reports based on data. (HS-LS2-6)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

HS-LS3 Heredity: Inheritance and Variation of Traits

HS-LS3 Heredity: Inheritance and Variation of Traits

Students who demonstrate understanding can:

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

Analyzing and Interpreting Data

Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

Disciplinary Core Ideas

LS1.A: Structure and Function

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. *(secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)*

LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

LS3.B: Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2)

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

Connections to Nature of Science

Science is a Human Endeavor

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

Connections to other DCIs in this grave-band: **HS.LS2.A** (HS-LS3-3); **HS.LS2.C** (HS-LS3-3); **HS.LS4.B** (HS-LS3-3); **HS.LS4.C** (HS-LS3-3)

Articulation across grade-bands: **MS.LS2.A** (HS-LS3-3); **MS.LS3.A** (HS-LS3-1),(HS-LS3-2); **MS.LS3.B** (HS-LS3-1),(HS-LS3-2),(HS-LS3-3); **MS.LS4.C** (HS-LS3-3)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-LS3-1),(HS-LS3-2)*

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. *(HS-LS3-1)*

WHST.9-12.1 Write arguments focused on *discipline-specific content.* (HS-LS3-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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HS-LS4 Biological Evolution: Unity and Diversity

HS-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)

Using Mathematics and Computational Thinking
Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)

Engaging in Argument from Evidence
Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 9–12

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

LS4.B: Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)

LS4.C: Adaptation

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6)

Crosscutting Concepts

Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5),(HS-LS4-6)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. ▪ Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1) -- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)	▪ Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5) **LS4.D: Biodiversity and Humans** ▪ Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (HS-LS4-6) *(Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.)* **ETS1.B: Developing Possible Solutions** ▪ When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-LS4-6)* ▪ Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary to HS-LS4-6)*	

Connections to other DCIs in this grade-band: **HS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS2.D** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS3.A** (HS-LS4-1); **HS.LS3.B** (HS-LS4-1),(HS-LS4-2) (HS-LS4-3),(HS-LS4-5); **HS.ESS1.C** (HS-LS4-1); **HS.ESS2.D** (HS-LS4-6); **HS.ESS2.E** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.A** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.C** (HS-LS4-6); **HS.ESS3.D** (HS-LS4-6)

Articulation across grade-bands: **MS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-5); **MS.LS2.C** (HS-LS4-5),(HS-LS4-6); **MS.LS3.A** (HS-LS4-1); **MS.LS3.B** (HS-LS4-1),(HS-LS4-2),(HS-LS4-3); **MS.LS4.A** (HS-LS4-1); **MS.LS4.B** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4); **MS.LS4.C** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **MS.ESS1.C** (HS-LS4-1); **MS.ESS3.C** (HS-LS4-5),(HS-LS4-6)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4)
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS4-5)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4)
WHST.9-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. *(HS-LS4-6)*
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS4-6)
WHST.9-12.9	Draw evidence from informational texts to support analysis, reflection, and research. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4),(HS-LS4-5)
SL.11-12.4	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. *(HS-LS4-1),(HS-LS4-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(HS-LS4-1)*,(HS-LS4-2),(HS-LS4-3),*(HS-LS4-4),(HS-LS4-5)*
MP.4	Model with mathematics. *(HS-LS4-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS1 Earth's Place in the Universe

HS-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.]

HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]

HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]

HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]

HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]

HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS1-1)

Using Mathematical and Computational Thinking

Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical or computational representations of phenomena to describe explanations. (HS-ESS1-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS1-2)
- Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-ESS1-5)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 9–12

Disciplinary Core Ideas

ESS1.A: The Universe and Its Stars

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3)
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3)

ESS1.B: Earth and the Solar System

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4)

ESS1.C: The History of Planet Earth

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. *(ESS2.B Grade 8 GBE) (secondary to*

Crosscutting Concepts

Patterns

- Empirical evidence is needed to identify patterns. (HS-ESS1-5)

Scale, Proportion, and Quantity

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-ESS1-1)
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)

Energy and Matter

- Energy cannot be created or destroyed–only moved between one place and another place, between objects and/or fields, or between systems. (HS-ESS1-2)
- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-ESS1-3)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS1-6)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS1-2),(HS-ESS1-4)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. ▪ Communicate scientific ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-ESS1-3) --- ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** ▪ A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-2),(HS-ESS1-6) ▪ Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. (HS-ESS1-6)	*HS-ESS1-5)* **PS1.C: Nuclear Processes** ▪ Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. *(secondary to HS-ESS1-5),(secondary to HS-ESS1-6)* **PS3.D: Energy in Chemical Processes and Everyday Life** ▪ Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. *(secondary to HS-ESS1-1)* **PS4.B Electromagnetic Radiation** ▪ Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. *(secondary to HS-ESS1-2)*	▪ Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2) ▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-ESS1-2)

Connections to other DCIs in this grade-band: **HS.PS1.A** (HS-ESS1-2),(HS-ESS1-3); **HS.PS1.C** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **HS.PS2.A** (HS-ESS1-6); **HS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **HS.PS3.A** (HS-ESS1-1),(HS-ESS1-2); **HS.PS3.B** (HS-ESS1-2),(HS-ESS1-5); **HS.PS4.A** (HS-ESS1-2); **HS.ESS2.A** (HS-ESS1-5)

Articulation of DCIs across grade-bands: **MS.PS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **MS.PS2.A** (HS-ESS1-4); **MS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **MS.PS4.B** (HS-ESS1-1),(HS-ESS1-2); **MS.ESS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4); **MS.ESS1.B** (HS-ESS1-4),(HS-ESS1-6); **MS.ESS1.C** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.A** (HS-ESS1-1),(HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.B** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.D** (HS-ESS1-1)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-5),(HS-ESS1-6)*
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS1-5),(HS-ESS1-6)
WHST.9-12.1	Write arguments focused on *discipline-specific content.* (HS-ESS1-6)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS1-2),*(HS-ESS1-3),(HS-ESS1-5)*
SL.11-12.4	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. *(HS-ESS1-3)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)
MP.4	Model with mathematics. (HS-ESS1-1),(HS-ESS1-4)
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2),*(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)*
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6)
HSA-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. *(HS-ESS1-1),(HS-ESS1-2),*(HS-ESS1-4)
HSA-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)*
HSA-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)*
HSF-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *(HS-ESS1-6)*
HSS-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how those variables are related. *(HS-ESS1-6)*

HS-ESS2 Earth's Systems

HS-ESS2 Earth's Systems

Students who demonstrate understanding can:

HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]

HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-6)
- Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)

Planning and Carrying Out Investigations

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5)

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2)

Disciplinary Core Ideas

ESS1.B: Earth and the Solar System

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. *(secondary to HS-ESS2-4)*

ESS2.A: Earth Materials and Systems

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1),(HS-ESS2-2)
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2-4)

Energy and Matter

- The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6)
- Energy drives the cycling of matter within and between systems. (HS-ESS2-3)

Structure and Function

- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS2-1)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS2-2)

Connections to Engineering, Technology, and Applications of Science

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS2 Earth's Systems

Engaging in Argument from Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. ▪ Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7) --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Science knowledge is based on empirical evidence. (HS-ESS2-3) ▪ Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (HS-ESS2-3) ▪ Science includes the process of coordinating patterns of evidence with current theory. (HS-ESS2-3) ▪ Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4)	▪ Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(ESS2.B Grade 8 GBE)* (HS-ESS2-1) **ESS2.C: The Roles of Water in Earth's Surface Processes** ▪ The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5) **ESS2.D: Weather and Climate** ▪ The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-4) ▪ Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7) ▪ Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6),(HS-ESS2-4) **ESS2.E: Biogeology** ▪ The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7) **PS4.A: Wave Properties** ▪ Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. *(secondary to HS-ESS2-3)*	**Interdependence of Science, Engineering, and Technology** ▪ Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS2-3) **Influence of Engineering, Technology, and Science on Society and the Natural World** ▪ New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS2-2)

Connections to other DCIs in this grade-band: **HS.PS1.A** (HS-ESS2-5),(HS-ESS2-6); **HS.PS1.B** (HS-ESS2-5),(HS-ESS2-6); **HS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **HS.PS3.A** (HS-ESS2-4); **HS.PS3.B** (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5); **HS.PS3.D** (HS-ESS2-3),(HS-ESS2-6); **HS.PS4.B** (HS-ESS2-2); **HS.LS1.C** (HS-ESS2-6); **HS.LS2.A** (HS-ESS2-7); **HS.LS2.B** (HS-ESS2-2),(HS-ESS2-6); **HS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **HS.LS4.A** (HS-ESS2-7); **HS.LS4.B** (HS-ESS2-7); **HS.LS4.C** (HS-ESS2-7); **HS.LS4.D** (HS-ESS2-2),(HS-ESS2-7); **HS.ESS1.C** (HS-ESS2-4); **HS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **HS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

Articulation of DCIs across grade-bands: **MS.PS1.A** (HS-ESS2-3),(HS-ESS2-5),(HS-ESS2-6); **MS.PS1.B** (HS-ESS2-3); **MS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **MS.PS3.A** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.B** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.PS4.B** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **MS.LS1.C** (HS-ESS2-4); **MS.LS2.A** (HS-ESS2-7); **MS.LS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **MS.LS4.A** (HS-ESS2-7); **MS.LS4.B** (HS-ESS2-7); **MS.LS4.C** (HS-ESS2-2),(HS-ESS2-7); **MS.ESS1.C** (HS-ESS2-1),(HS-ESS2-7); **MS.ESS2.A** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6); **MS.ESS2.C** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.D** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5); **MS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-ESS2-2),(HS-ESS2-3)*
RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. *(HS-ESS2-2)*
WHST.9-12.1	Write arguments focused on *discipline-specific content.* (HS-ESS2-7)
WHST.9-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-ESS2-5)
SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. *(HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4)*

Mathematics –

MP.2	Reason abstractly and quantitatively. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
MP.4	Model with mathematics. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6)
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ESS3 Earth and Human Activity

HS-ESS3 Earth and Human Activity

Students who demonstrate understanding can:

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3)
- Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)
- Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4)

Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8

Disciplinary Core Ideas

ESS2.D: Weather and Climate

- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. *(secondary to HS-ESS3-6)*

ESS3.A: Natural Resources

- Resource availability has guided the development of human society. (HS-ESS3-1)
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

ESS3.B: Natural Hazards

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

ESS3.C: Human Impacts on Earth Systems

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)

ESS3.D: Global Climate Change

- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5)
- Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6)

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into

Crosscutting Concepts

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3),(HS-ESS3-5)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Modern civilization depends on major technological systems. (HS-ESS3-1),(HS-ESS3-3)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-2),(HS-ESS3-4)
- New technologies can have deep impacts

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

<table>
<tr>
<td>experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
▪ Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)

Connections to Nature of Science
Scientific Investigations Use a Variety of Methods
▪ Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5)
▪ New technologies advance scientific knowledge. (HS-ESS3-5)
Scientific Knowledge is Based on Empirical Evidence
▪ Science knowledge is based on empirical evidence. (HS-ESS3-5)
▪ Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS3-5)</td>
<td>account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2),(secondary HS-ESS3-4)</td>
<td>on society and the environment, including some that were not anticipated. (HS-ESS3-3)
▪ Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)

Connections to Nature of Science
Science is a Human Endeavor
▪ Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)
Science Addresses Questions About the Natural and Material World
▪ Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2)
▪ Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2)
▪ Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)</td>
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Connections to other DCIs in this grade-band: **HS.PS1.B** (HS-ESS3-3); **HS.PS3.B** (HS-ESS3-2),(HS-ESS3-5); **HS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **HS.LS1.C** (HS-ESS3-5); **HS.LS2.A** (HS-ESS3-2),(HS-ESS3-3); **HS.LS2.B** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.LS4.D** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.ESS2.A** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.ESS2.D** (HS-ESS3-5); **HS.ESS2.E** (HS-ESS3-3)

Articulation of DCIs across grade-bands: **MS.PS1.B** (HS-ESS3-3); **MS.PS3.B** (HS-ESS3-5); **MS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **MS.LS2.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.LS2.B** (HS-ESS3-2),(HS-ESS3-3); **MS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **MS.LS4.C** (HS-ESS3-3); **MS.LS4.D** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS2.A** (HS-ESS3-1),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS2.C** (HS-ESS3-6); **MS.ESS2.D** (HS-ESS3-5); **MS.ESS3.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS3.B** (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5); **MS.ESS3.C** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS3.D** (HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-4),(HS-ESS3-5)
RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. *(HS-ESS3-5)*
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ESS3-5)
RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS3-2),(HS-ESS3-4)
WHST.9-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1)

Mathematics –

MP.2	Reason abstractly and quantitatively. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-3),*(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6)
MP.4	Model with mathematics. (HS-ESS3-3),(HS-ESS3-6)
HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *(HS-ESS3-1)*,(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)
HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. *(HS-ESS3-1)*,*(HS-ESS3-4)*,*(HS-ESS3-5)*,(HS-ESS3-6)
HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-ESS3-1)*,*(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HS-ETS1 Engineering Design

HS-ETS1 Engineering Design

Students who demonstrate understanding can:

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems. (HS-ETS1-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.

- Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-2)
- Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1)
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4)

ETS1.C: Optimizing the Design Solution

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)

Crosscutting Concepts

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-ETS1-4)

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ETS1-1) (HS-ETS1-3)

Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems include:

Physical Science: HS-PS2-3, HS-PS3-3

Connections to HS-ETS1.B: Designing Solutions to Engineering Problems include:

Earth and Space Science: HS-ESS3-2, HS-ESS3-4, **Life Science:** HS-LS2-7, HS-LS4-6

Connections to HS-ETS1.C: Optimizing the Design Solution include:

Physical Science: HS-PS1-6, HS-PS2-3

Articulation of DCIs across grade-bands: **MS.ETS1.A** (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.B** (HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.C** (HS-ETS1-2),(HS-ETS1-4)

Common Core State Standards Connections:

ELA/Literacy –

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ETS1-1),*(HS-ETS1-3)*

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. *(HS-ETS1-1),*(HS-ETS1-3)

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-1),*(HS-ETS1-3)*

Mathematics –

MP.2 Reason abstractly and quantitatively. (HS-ETS1-1),*(HS-ETS1-3),(HS-ETS1-4)*

MP.4 Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4)