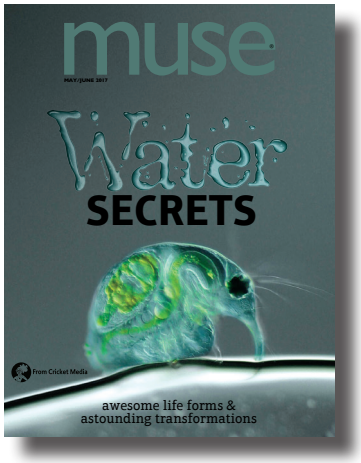
Teacher's Guide

MAGAZINE ARTICLES

Contents

Teacher's Guide for *Muse: Water Secrets*



OVERVIEW

In this magazine, readers will take a closer look at the importance of water to both animals and humans. **Muse: Water Secrets** *includes information about the tiniest water animals and how they survive under the harshest conditions. In addition, the magazine looks at water's role in space exploration and how phony science has resulted in a "healthy water" manufacturing boom.*

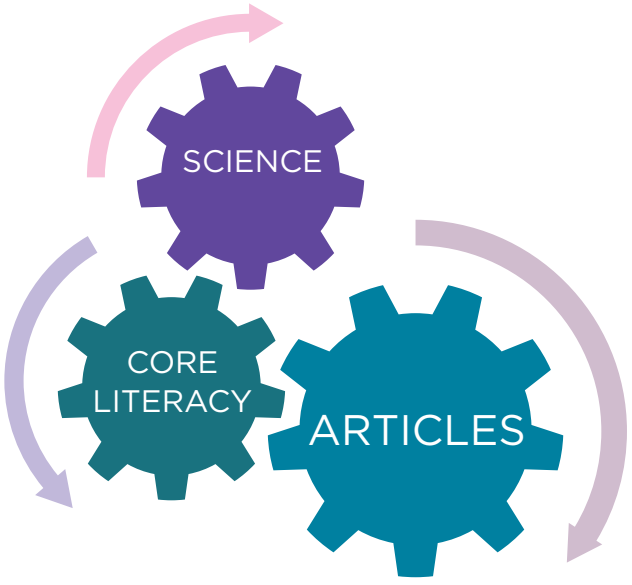
ESSENTIAL QUESTION:

What is the relationship between water and life?

We invite you to use this magazine as a flexible teaching tool, ideal for providing interdisciplinary instruction of social studies and science content as well as core literacy concepts. Find practical advice for teaching individual articles or use a mini-unit that helps your students make cross-text connections as they integrate ideas and information.

READ INDIVIDUAL ARTICLES PAGES 4 – 8

Each article in this magazine is well-suited for teaching literacy concepts and content area knowledge. For each individual article in this guide, you'll find the following:



TEACH A MINI-UNIT PAGES 10-12

Magazine articles can easily be grouped to make cross-text connections and comparisons. Our Mini-Unit allows students to read and discuss multiple articles and integrate ideas and information (CCSS.Reading.9). Discussing multiple articles (CCSS.Reading.9) prepares students to write texts to share and publish in a variety of ways (CCSS.Writing.2).

Skills and Standards Overview

Essential Question: What is the relationship between water and life?

MAGAZINE ARTICLES	CORE CONTENT CONCEPT	LITERACY SKILLS	CORRESPONDING CCSS ANCHOR STANDARDS
The Wild Science of Water Bears Expository Nonfiction	Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions.	• Close Reading • Understand Point of View • Evaluate Evidence • Write a Press Release	*Reading 1, 2, 3, 6 & 8* *Writing 2*
Water Fleas, Transform! Expository Nonfiction	Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms.	• Close Reading • Analyze Text Structure • Analyze Point of View • Write a Comic Strip	*Reading 1, 3, 5 & 6* *Writing 3*
Searching for the Source of Life Expository Nonfiction	Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors.	• Close Reading • Understand Point of View • Interpret Visual Information • Hold a Debate	*Reading 2, 3, 6 & 7* *Speaking & Listening 1 & 6*
Fish in the Desert Expository Nonfiction	Growth of organisms and population increases are limited by access to resources.	• Close Reading • Interpret Figurative Meaning • Evaluate Evidence • Collaborate	*Reading 1, 3, 4 & 8* *Speaking & Listening 1*
Healing Waters Expository Nonfiction	The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values.	• Close Reading • Analyze Text Structure • Determine Author's Tone • Write an Op-Ed	*Reading 1, 2, 3, 5 & 6* *Writing 1*

Comparing Texts: *Reading 1, 2, 3 & 9*

Mini-Unit: *Reading 1, 2 & 3; Speaking & Listening 1, 4 & 6*

ARTICLE: The Wild Science of Water Bears

Magazine pages 10-14, Expository Nonfiction

Tardigrades are tiny invertebrates that are tough enough to withstand the harshest conditions. Scientists study them to learn about their adaptations and hope to apply what they learn to improve the world of medicine.

ESSENTIAL QUESTION

What is the relationship between water and life?

CORE CONTENT CONCEPT

Science Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions.

CROSS-CURRICULAR EXTENSION

Math Use average high/low temperatures of the seven continents to draw conclusions about tardigrades and their adaptive abilities.

KEY VOCABULARY

dissect (p. 12) to study or examine something closely and carefully

translucent (p. 12) not completely clear or transparent but clear enough to allow light to pass through

revive (p. 13) to become strong, healthy, or active again

genome (p. 13) the complete set of genes or genetic material present in a cell or organism

PREPARE TO READ

Ask students to brainstorm a list of types of bears. Review the list to discuss where each kind of bear lives and under what conditions. Then share this fact: "There is another type of bear: It is the water bear." Ask students to brainstorm the characteristics of this creature.

CLOSE READING AND TEXT ANALYSIS

Key Ideas

- Locate details listed on page 12 to create your own description of a water bear. *CCSS Reading 1*
- Refer to evidence in the article to summarize what a water bear can/cannot do. *CCSS Reading 2*
- Explore the relationships between the experiments discussed in the article and their overall impact on the scientific world. Cite textual evidence when stating your answer. *CCSS Reading 3*

Craft and Structure

- **Understand Point of View** When Alex Young and William Miller published their discovery of a new tardigrade species, one says it was "exhilarating" while the other says "unsettling." Examine why they would have such different points of view. *CCSS Reading 6*
- **Evaluate Evidence** Locate evidence in the article showing the resilience of water bears. Is the evidence sufficient? Why/why not? *CCSS Reading 8*

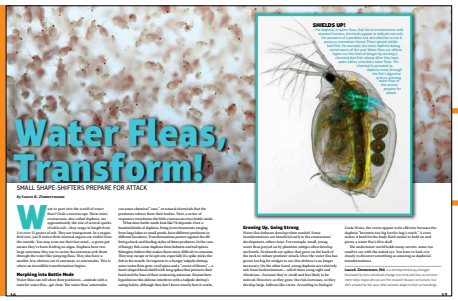
WRITING

Write a Press Release Assume scientists are able to transform the pharmaceutical industry by using tardigrade protein to ensure medicine no longer requires refrigeration. Write a press release for news agencies about this scientific achievement and how it will impact the world's population.

ARTICLE: Water Fleas, Transform!

Magazine pages 16-17, Expository Nonfiction

Lexile Score: 1020



Daphnia, or water fleas, are microscopic crustaceans that transform as a way of defense against predators. Their transformations differ based on the type of predator, making what looks like an easy meal an unpleasant experience for the unsuspecting predator.

ESSENTIAL QUESTION

What is the relationship between water and life?

CORE CONTENT CONCEPT

Science Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms.

CROSS-CURRICULAR EXTENSION

Language Arts Main characters often go through a "transforming" experience, whether it's life threatening or not. Analyze a piece of literature to discuss the main character's transformation.

KEY VOCABULARY

crustaceans (p. 16) a type of animal (such as a crab or lobster) that has several pairs of legs and a body made up of sections that are covered in a hard outer shell

transparent (p. 16) able to be seen through

transform (p. 16) to change in appearance

PREPARE TO READ

Ask students to define and summarize what they know about transforming, morphing, and shape-shifting. Hypothesize how these abilities could contribute to the ability to defend oneself.

CLOSE READING AND TEXT ANALYSIS

Key Ideas

- Use information from the text to describe how water fleas morph into battle mode. *CCSS Reading 1*
- What can you conclude about the water flea's abilities to survive? Refer to details from the text in your answer. *CCSS Reading 1*
- Combine your knowledge with details from the text to compare/contrast the common dog flea and the water flea. *CCSS Reading 3*

Craft and Structure

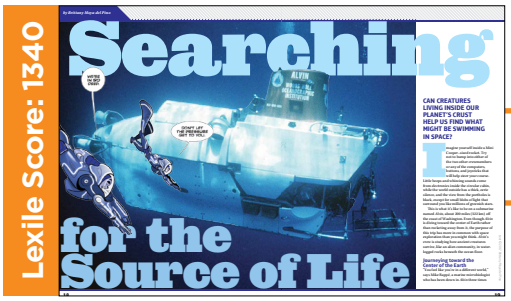
- **Analyze Text Structure** This author chose a problem/solution format. Analyze the text and subheadings to list the main problem and the three solutions water fleas use to overcome it. *CCSS Reading 5*
- **Analyze Point of View** What is the author's point of view on which of the five senses is most important to water flea survival? Support your answer with evidence from the article. *CCSS Reading 6*

WRITING

Write a Comic Strip Take a light-hearted look at the life of a water flea. Write a comic strip where water fleas and their predators are the main characters. Be sure to illustrate at least one transforming moment in a water flea's life.

ARTICLE: Searching for the Source of Life

Magazine pages 18-23, Expository Nonfiction



Scientists searching for the source of life are using water trapped deep in the earth's crust to determine how organisms survive under harsh conditions and also how they are related to organisms living above the ocean. Scientists hope this knowledge can be applied to the quest for life in outer space.

ESSENTIAL QUESTION

What is the relationship between water and life?

CORE CONTENT CONCEPT

Science Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors.

CROSS-CURRICULAR EXTENSION

Geography What are the main geographic features of the ocean floor? Conduct research to find out.

KEY VOCABULARY

bioluminescent (p. 20) the biochemical emission of light by living organisms such as fireflies and deep-sea fishes

flank (p. 20) the side of something

hydrothermal (p. 23) of, relating to, or denoting the action of heated water in the earth's crust

PREPARE TO READ

Ask students to summarize what they know about the ocean floor. Prompt them to discuss temperature, pressure, amount of sunlight, and types of organisms inhabiting this area. Then, using this information, have students hypothesize what scientists might find if they drilled into the ocean floor.

CLOSE READING AND TEXT ANALYSIS

Key Ideas

- Summarize Laurie Barge's new theory on the origin of life. *CCSS Reading 2*
- Using details from the article, compare and contrast water pulled from under the ocean floor with regular water. *CCSS Reading 3*
- Describe the relationship between the studies being done on earth to the search for life in outer space. *CCSS Reading 3*

Craft and Structure

- **Understand Point of View** The author presents ideas modern scientists have about how life can evolve in the earth's crust. Based on evidence in the text, how might Charles Darwin respond to their ideas? *CCSS Reading 6*
- **Interpret Visual Information** Combine information from the article with the graphics on pages 22 and 24-25. How do these visual aids contribute to your understanding of the information? What additional information do they convey? *CCSS Reading 7*

SPEAKING AND LISTENING

Hold a Debate The article says the water pumped from under the seafloor contains no oxygen. But if water contains no oxygen, then what is it? H2O-O=? Is it possible to have water without oxygen? Debate whether it is water or oxygen that is needed to sustain life.

ARTICLE: Fish in the Desert

Magazine pages 34-39, Expository Nonfiction

Lexile Score: 940

The Devils Hole pupfish is the rarest fish in the world. Living in a shallow pool at the edge of an oasis in the Mojave Desert, the Devils Hole pupfish clings to survival. Human interaction has threatened their existence in the past and now humans are intervening to ensure their survival.

ESSENTIAL QUESTION

What is the relationship between water and life?

CORE CONTENT CONCEPT

Science Growth of organisms and population increases are limited by access to resources.

CROSS-CURRICULAR EXTENSION

Government/Civics Research water rights in the U.S. Determine the difference between riparian doctrine and prior appropriation doctrine. Find out why pupfish won water rights!

KEY VOCABULARY

predicament (p. 36) a difficult or unpleasant situation

oasis (p. 36) an area in a desert where there is water and plants

omnivore (p. 36) an animal that eats both plants and other animals

PREPARE TO READ

Show students a physical map of the U.S. Ask them to locate the Mojave Desert. Based on geographic location, ask students to infer details about the climate and geography of this region. Then refer to the article's title. Ask students to hypothesize where fish might be able to survive in a desert.

CLOSE READING AND TEXT ANALYSIS

Key Ideas

- How did pupfish come to reside in Devils Hole? Make inferences based on text details. *CCSS Reading 1*
- What makes the Devils Hole pupfish the rarest fish in the world? Support your answer with text evidence. *CCSS Reading 1*
- Locate several cause/effect relationships between people and the environment. *CCSS Reading 3*

Craft and Structure

- **Interpret Figurative Meaning** The second subheading is "Life in 'Paradise.'" Why does the author use quotes? In what ways is it an accurate/inaccurate description of the habitat? *CCSS Reading 4*
- **Evaluate Evidence** Evaluate this claim: Serious efforts have been made to preserve the pupfish. Is the evidence presented sufficient to support this claim? What additional information might be necessary? *CCSS Reading 8*

SPEAKING AND LISTENING

Collaborate Aquatic ecologist Kevin Wilson poses the question, "What's our responsibility when we muck things up?" Explore the relationship between people and the environment. With a partner, discuss possible answers to this question and determine ways to communicate these responsibilities to the general population.

ARTICLE: Healing Waters

Magazine pages 40-45, Expository Nonfiction

Lexile Score: 1000

Water: It's so important, our very lives depend on it. But manufacturers who promise their "special" waters can do everything from enhancing your athletic performance to curing disease may be handing you nothing but a big dose of phony science.

ESSENTIAL QUESTION

What is the relationship between water and life?

CORE CONTENT CONCEPT

Science The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values.

CROSS-CURRICULAR EXTENSION

Math Assume a bottle of living water costs $3. Use this information to estimate the annual cost of drinking the water if you drink 2-3 bottles per day. What does that amount to over a lifetime?

KEY VOCABULARY

detoxify (p. 41) to remove a poisonous or harmful substance from something

hexagon (p. 41) a flat shape that has six angles and six sides

homeopathic (p. 42) a system for treating illnesses that uses very small amounts of substances that would in larger amounts produce symptoms of the illnesses in healthy people

PREPARE TO READ

Ask students to define propaganda. Who uses it? Why? (Prior to class, conduct an online search for oxygenated water or alkaline water.) Show students an advertisement for one of these products. Ask students if they can decipher between scientific fact and unsubstantiated claim.

CLOSE READING AND TEXT ANALYSIS

Key Ideas

- Create a three-column chart with the headings: oxygenated water, alkaline water, and homeopathic water. List key details under each heading. *CCSS Reading 1*
- What is the theme of the article? Support your conclusion with text evidence. *CCSS Reading 2*
- Describe the relationships between scientists and product manufacturers. Base your answer on details mentioned in the article. *CCSS Reading 3*

Craft and Structure

- **Analyze Text Structure** The author states a claim and then presents the science afterward. Why is this text structure effective? *CCSS Reading 5*
- **Determine Author's Tone** This article attempts to debunk water myths. Locate specific phrases/transitions/sentences in which the author takes an argumentative tone. Why is this effective at communicating the main idea of the article? *CCSS Reading 6*

WRITING

Write an Op-Ed Have you ever tried homeopathic remedies or any of the types of water mentioned in the article? Do you know someone who has? What's your opinion on their production and use? Answer these questions in an op-ed, or editorial, where you state your experience and opinions. Refer to details in the text to offer reasons and support for your opinion.

CROSS-TEXT CONNECTIONS

SYNTHESIZE: Guide students to compare articles they read. Help students find the connections between pieces of information in multiple articles. Use prompts, such as the following examples, to have students work together to **Integrate Ideas and Information** *(CCSS.Reading.9)*.

- Viewing water through a microscope reveals an entirely new world. Read "The Wild Science of Water Bears" "Water Fleas, Transform!" and "Searching for the Source of Life" to gather information about the role of microscopic water organisms. Write an informative essay explaining how these organisms show resilience on a much larger scale than expected.

- Many animals have adapted to the harsh conditions they live under. Reread multiple texts to create a T-chart of animal type and adaptations that allow it to exist.

- Investigative Reporting: Assume you are interviewing someone who claims they are bottling a glacial water enhanced with ancient air bubbles. This water can stimulate hair growth, boost metabolism, cure bunions, and enhance hearing. Read "Healing Waters" and the Science at Work department for background information. Then build a list of interview questions that may help consumers decipher if the product is truly worth their money.

- You are on a space mission. Your goal is to collect water samples, in any state, and examine them for signs of life. Read multiple articles to determine the different places and ways water is observed, collected, and analyzed. Create a Space Log where you enter your location, specimen, how it was obtained, and observations.

- This issue revolves around the theme "Water Secrets." Read multiple articles. Take notes on the "secrets" revealed by scientists in each one. Choose three secrets that you feel are the most interesting. Write these on a small piece of paper. Exchange your secrets with a classmate by passing notes. Did your classmate choose the same secrets? Pass notes again. It's okay if the teacher catches you!

EXPLORATORY LEARNING - FLEXIBLE MINI-UNIT DESIGN

ENGAGE | **READ FOR A PURPOSE** | **APPLY**

In this issue of *Muse,* students learn about the watery environments that host some of the toughest organisms on the planet. In this mini-unit, students will synthesize information from the magazine articles to create a presentation for the class on a topic of their choosing. While students present, the rest of the class will listen and record questions to ask presenters.

ENGAGE: Engage students in the topic of water and life by focusing on the Essential Question: What is the relationship between water and life? Draw their attention to the graphic organizer below. Assist students in building background knowledge by completing it together. Start in the center and work your way out. (Sample text is shown.)

What I learned:

- Some of the smallest and toughest organisms live in water.

What I already knew:

- Covers most of the earth
- Needs to be clean and drinkable

Topic:
Water and Life

READ FOR A PURPOSE

INTRODUCE THE ACTIVITY: IT'S IN THE WATER! Explain to students that they will create presentations on topics related to the magazine articles. Continue by explaining that they will research their topics using the magazine articles and then come up with a way to present their topics to the class. Students may work individually or in pairs or small groups for this project. Several topic suggestions are listed below. Allow students to choose one of these topics or to come up with their own topic ideas.

- Extreme Environments—You live where?
- Micro-Survivors—How do they do it?
- Life on Earth . . . and Beyond!
- Transformers and Adaptors—Thank you for being a flexible being.
- Extreme Diets—You eat what?

RETURN TO THE TEXT: Before students can begin developing their presentations, they must first read articles to gather information about their topics. Tell students to use at least two articles for their research. Distribute one copy of the Research Notes graphic organizer to each student and have them work individually or with their partners or groups to gather information.

APPLY: IT'S IN THE WATER! Now that students have gathered information from the magazine articles, they are ready to develop their presentations.

Materials

- completed Research Notes graphic organizers
- art supplies, such as paper, markers, and colored pencils
- other materials as needed

STEP 1: Build Background Tell students that they may present their topics in any format they can think of, including

- traditional oral report
- poster report
- presentation software report
- dramatic reenactment
- interview/talk show
- 3D model presentation

STEP 2: Brainstorm Have individuals, pairs, and groups decide how they will present their topics. Tell students to write a proposal and present it to you before they move on to the next step.

STEP 3: Create Presentations Have students gather the supplies they need to create their presentations. Help students develop schedules to accomplish everything they need to do.

STEP 4: Present Have students, pairs, and groups take turns presenting their topics. Remind students in the audience to listen carefully and come up with questions they would like to ask the presenters. After each presentation, allow time for several questions.

NAME: _____

RESEARCH NOTES

Presentation Topic:	
Notes from _____	**Notes from** _____

Appendix

Meeting State and National Standards: Core Instructional Concepts

The articles in this magazine provide a wealth of opportunities for meeting state and national instructional standards. The following pages contain charts listing Core Instructional Concepts for each of three curricular areas: English Language Arts, Science, and Social Studies.

USING THE STANDARDS CHARTS

ELA

Corresponding CCSS anchor standards have been listed next to each item on the Core Instructional Concepts chart. To customize the chart, add your own grade, state, or district standards in the last column. Match the concepts and standards from the chart to the activities on each page of the Teacher's Guide to complete your lesson plans.

SOCIAL STUDIES

Content Concepts in each Article Guide are based on Dimension 2 of the CS Framework for Social Studies: Applying Disciplinary Concepts and Tools. Use the last column in the accompanying chart to correlate these concepts to your state or district standards.

SCIENCE

Content Concepts in each Article Guide are drawn from the Three Dimensions of the Next Generation Science Standards. You will also find connections to these concepts within individual close-reading questions.

MATH

Content Opportunities for math activities are provided in the Cross-Curricular extensions on each Article Guide page.

CORE INSTRUCTIONAL CONCEPTS: READING, LITERATURE, AND LANGUAGE ARTS

SKILLS AND CONCEPTS	CCSS ANCHOR STANDARD	CORRESPONDING STANDARD
KEY IDEAS AND DETAILS		
Read closely to determine what a text says explicitly.	Reading 1	
Make logical inferences to determine what the text communicates implicitly.	Reading 1	
Cite specific textual evidence to support conclusions drawn from the text.	Reading 1	
Determine central ideas or themes of a text and analyze their development.	Reading 2	
Summarize key supporting details and ideas.	Reading 2	
Analyze how **individuals, events, and ideas develop and interact** over the course of a text.	Reading 3	
CRAFT AND STRUCTURE		
Interpret words and phrases as they are used in a text.	Reading 4	
Determine technical, connotative, and figurative meanings.	Reading 4	
Analyze how specific **word choices** shape meaning or tone.	Reading 4	
Analyze the **structure of texts** (sequence, cause/effect, compare/contrast, problem/solution)	Reading 5	
Recognize the **genre**, **key elements, and characteristics** of literary texts.	Reading 5	
Assess how **point of view or purpose** shapes the content and style of a text.	Reading 6	
Analyze how an **author's style and tone** affects meaning.	Reading 6	
INTEGRATION OF KNOWLEDGE AND IDEAS		
Integrate and evaluate content presented in diverse media and formats.	Reading 7	
Identify and evaluate the argument and claims in a text.	Reading 8	
Analyze how two or more texts address similar themes or topics.	Reading 9	
WRITING		
Write **arguments** to support claims, using valid reasoning and relevant and sufficient evidence.	Writing 1	
Write **informative/explanatory texts** to examine and convey complex ideas and information clearly and accurately.	Writing 2	
Write **narratives** to develop real or imagined experiences or events.	Writing 3	
Draw evidence from literary or informational texts to support analysis, reflection, and research.	Writing 9	
Conduct short as well as more sustained **research projects.**	Writing 10	

CORE INSTRUCTIONAL CONCEPTS: SOCIAL STUDIES

C3 INQUIRY ARC DIMENSION 2: APPLYING DISCIPLINARY CONCEPTS AND TOOLS	STATE OR DISTRICT STANDARD
CIVICS	
Analyze the **origins, functions, and structure of different governments** and the **origins and purposes of laws** and key constitutional provisions.	
Summarize core **civic virtues and democratic principles.**	
Evaluate **policies** intended to address social issues.	
ECONOMICS	
Evaluate the **benefits and costs of individual economic choices.**	
Analyze **economic incentives,** including those that cause people and businesses to specialize and trade.	
Explain the **importance of resources** (i.e. labor, human capital, physical capital, natural resources) in **methods of economic production.**	
Explain the **functions of money** in a market economy.	
Explain the importance of **competition** in a market economy.	
Apply economic concepts (i.e. interest rate, inflation, supply and demand) and theories of **how individual and government actions affect the production of goods and services.**	
Analyze economic patterns, including activity and interactions between and within nations.	
GEOGRAPHY	
Construct and use maps and other graphic representations (i.e. images, photographs, etc.) of different places.	
Explain cultural influences on the way people live and modify and adapt to their environments.	
Analyze places, including their physical, cultural and environmental characteristics and how they change over time.	
Analyze **movement of people, goods, and ideas.**	
Analyze regions, including how they relate to one another and the world as a whole from a political, economic, historical, and geographic perspective.	
HISTORY	
Interpret historical context to **understand relationships among historical events or developments.**	
Evaluate historical events and developments to identify them as **examples of historical change and/or continuity.**	
Analyze perspectives, including factors that influence why and how individuals and groups develop different ones.	
Evaluate historical sources, including their reliability, relevancy, utility, and limitations.	
Analyze causes and effects, both intended and unintended, of historical developments.	

CORE INSTRUCTIONAL CONCEPTS: SCIENCE

DIMENSION 1: SCIENTIFIC AND ENGINEERING PRACTICES

Dimension 1 focuses on the practice of science, and how knowledge is continually adapted based on new findings. The eight practices of the K-12 Science and Engineering Curriculum are as follows:

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

DIMENSION 2: CROSSCUTTING CONCEPTS

Dimension 2 provides an organizational schema for integrating and interrelating knowledge from different science domains. The eight NGSS Crosscutting Concepts are as follows:

- Patterns
- Similarity and Diversity
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

DIMENSION 3: DIMENSIONS AND DISCIPLINARY CORE IDEAS

Dimension 3 presents a contained set of Disciplinary Core Ideas to support deeper understanding and application of content. The following chart details Core Ideas for curriculum, instructional content, and assessments within four domains.

LIFE SCIENCE

- Structure and Function of Living Things
- Life Cycles and Stages
- Reproduction & Inherited Traits
- Animals
- Plants

PHYSICAL SCIENCE

- Forces and Interactions
- Energy
- Light
- Sound
- Electricity/ Magnetism
- Matter
- Waves
- Heat
- Chemistry
- Information Processing

EARTH SCIENCE

- Weather
- Climate
- Rocks & Soil
- Erosion and Weathering
- Landforms
- Water
- Oceans
- History of Earth
- Plate Tectonics
- Volcanoes, Earthquakes, and Tsunamis

SPACE SYSTEMS

- Solar System
- Planets
- Moon
- Sun