

# Teacher's Guide

# muse®

APRIL 2017

## MAGAZINE ARTICLES

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# WE TALK?

## Teacher's Guide for *Muse: Can We Talk?*

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## OVERVIEW

*In this magazine, readers will learn how communication patterns have changed over time. **Muse: Can We Talk?** includes information*

*about who and what people communicate with and how improvements in science and technology may alter ways we communicate in the future.*

## ESSENTIAL QUESTION:

***How have scientific advancements changed the way we communicate?***

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.

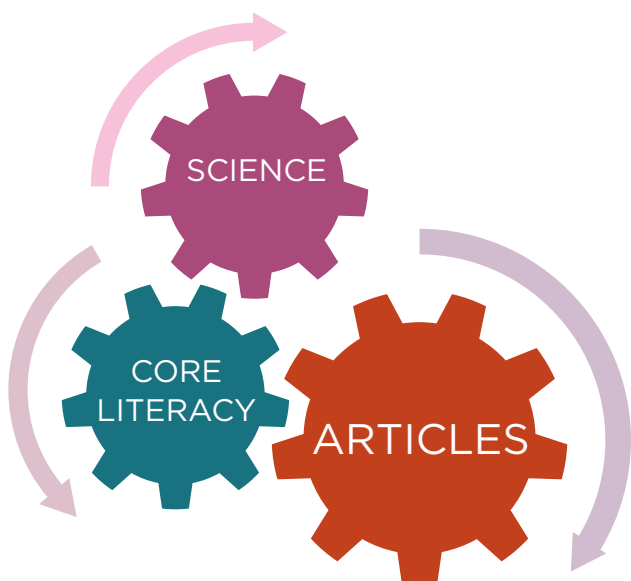
## READ INDIVIDUAL ARTICLES PAGES 4 - 8

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).





**Essential Question:** How have scientific advancements changed the way we communicate?

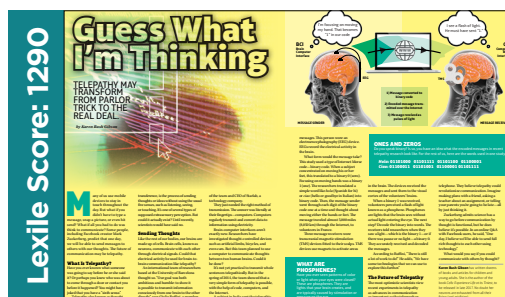
MAGAZINE ARTICLES	CORE CONTENT CONCEPT	LITERACY SKILLS	CORRESPONDING CCSS ANCHOR STANDARDS
<b>Guess What I'm Thinking</b> Expository Nonfiction	Sense receptors respond to stimuli by sending messages to the brain for immediate behavior or storage of memories.	<ul style="list-style-type: none"> <li>Close Reading</li> <li>Interpret Visual Information</li> <li>Evaluate Evidence</li> <li>Present a News Segment</li> </ul>	<i>Reading 1, 2, 3, 7 &amp; 8</i> <i>Speaking &amp; Listening 4 &amp; 6</i>
<b>Brain Chains</b> Expository Nonfiction	Cause and effect relationships may be used to predict phenomena in natural or designed systems.	<ul style="list-style-type: none"> <li>Close Reading</li> <li>Analyze Text Features</li> <li>Analyze Point of View</li> <li>Collaborate</li> </ul>	<i>Reading 1, 2, 3, 5 &amp; 6</i> <i>Speaking &amp; Listening 1 &amp; 6</i>
<b>Greetings from Earth</b> Expository Nonfiction	The uses of technologies and any limitations on their use are impacted by social values, the findings of scientific research, and economic conditions.	<ul style="list-style-type: none"> <li>Close Reading</li> <li>Analyze Point of View</li> <li>Analyze Text Structure</li> <li>Pitch a Movie Scene</li> </ul>	<i>Reading 1, 3, 5 &amp; 6</i> <i>Writing 3</i> <i>Speaking &amp; Listening 1 &amp; 6</i>
<b>Say What, Horse?</b> Expository Nonfiction	All species have the ability to communicate.	<ul style="list-style-type: none"> <li>Close Reading</li> <li>Interpret Visual Information</li> <li>Evaluate Evidence</li> <li>Write a Fable</li> </ul>	<i>Reading 1, 3, 7 &amp; 8</i> <i>Writing 3</i>
<b>Twitch Together</b> Expository Nonfiction	The uses of technologies and any limitations on their use are impacted by social values, the findings of scientific research, and economic conditions.	<ul style="list-style-type: none"> <li>Close Reading</li> <li>Evaluate Evidence</li> <li>Compare Texts</li> <li>Create a Trading Card</li> </ul>	<i>Reading 1, 2, 3, 8 &amp; 9</i> <i>Writing 2</i>

**Comparing Texts:** *Reading 9*

**Mini-Unit:** *Reading 1, 2, 3 & 9; Speaking & Listening 1, 4 & 6*

# ARTICLE: Guess What I'm Thinking

Magazine pages 10-11, Expository Nonfiction



Telepathy is the ability to send your thoughts to someone else's brain without using speech or any senses. Recent scientific experiments have left some scientists optimistic that communicating via telepathy is on the horizon.

## ESSENTIAL QUESTION

**How have scientific advancements changed the way we communicate?**

## CORE CONTENT CONCEPT

**Science** Sense receptors respond to stimuli by sending messages to the brain for immediate behavior or storage of memories.

## CROSS-CURRICULAR EXTENSION

### Computer Skills/Career Planning

Mark Zuckerberg makes a living off of computers and their ability to connect people. Create a list of occupations that could be related to the breakthrough field of telepathy.

## KEY VOCABULARY

**perception (p. 10)** the ability to understand or notice something easily

**interface (p. 10)** an area or system through which one machine is connected to another machine

**binary (p. 11)** relating to or involving a method of calculating and of representing information, especially in computers, by using the numbers 0 and 1

## PREPARE TO READ

Ask students if they have ever heard this expression: "You just read my mind!" Under what circumstances is it used? Then ask students to read your mind. Allow them to make predictions. Point out that based on seeing you and observing your actions, they may be able to closely guess what you think.

## CLOSE READING AND TEXT ANALYSIS

### Key Ideas

- Ruffini says, "We have some technologies that we can use to explore this further." Use information from the text to infer what those technologies might include. *CCSS Reading 1*
- Based on details from the article, summarize how the telepathic message was sent. *CCSS Reading 2*
- Describe the relationship between Morse code and binary code. Locate textual evidence to support your answer. *CCSS Reading 3*

### Craft and Structure

- Interpret Visual Information** How do the diagrams on page 11 aid your understanding of the telepathy experiment? What additional information do the diagrams provide? *CCSS Reading 7*
- Evaluate Evidence** Ruffini says, "Our goal was both ambitious and humble." Locate evidence supporting this claim. Is it relevant? *CCSS Reading 8*

## WRITING

**Produce a News Segment** Assume you are a TV news reporter. You have 30 seconds to explain this latest breakthrough in telepathic communication. What details are most important to convey? Write your news segment and then read it aloud to determine how close you are to your 30-second time limit.



What would happen if we could harness the brainpower of many people to work toward a common goal? This is the purpose behind the idea of brain chains: share knowledge to achieve a unified, faster, better result. But before brain chains become the next craze, scientists must figure out ways to protect people...and the thoughts in their heads.

## ESSENTIAL QUESTION

**How have scientific advancements changed the way we communicate?**

## CORE CONTENT CONCEPT

**Science** Cause and effect relationships may be used to predict phenomena in natural or designed systems.

## CROSS-CURRICULAR EXTENSION

**Language Arts** Write a science fiction story where brain chains and telepathy are the norm. How will society change once we can read each other's minds?

## KEY VOCABULARY

**neuron (p. 14)** a cell that carries messages between the brain and other parts of the body and is the basic unit of the nervous system

**electrode (p. 17)** one of the two points through which electricity flows into or out of a battery or other device

**meld (p. 17)** to blend or mix together

## PREPARE TO READ

Ask students what life would be like if all of their brains were linked. What if they could access information from anyone else's brain? What if your private thoughts were no longer private? Would they want to participate in such a world? Why or why not?

## CLOSE READING AND TEXT ANALYSIS

### Key Ideas

- Page 17 of the article lists hypothetical cause/effect situations. Analyze these and make inferences about other situations where brain chains could have positive/negative effects. *CCSS Reading 1*
- What is the main idea of the article? Which details directly support the main idea? *CCSS Reading 2*
- Use details from the text to list the order of experiments done before attempting to work with humans. *CCSS Reading 3*

### Craft and Structure

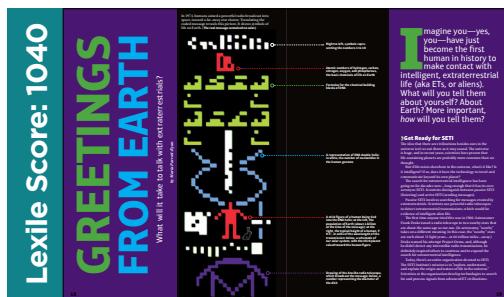
- **Analyze Text Features** How do the subheadings contribute to your understanding of the article? How might your understanding have been different if the subheadings were absent? *CCSS Reading 5*
- **Analyze Point of View** What is the author's point of view on "neural privacy" and "neural defense"? What clues from the text support your answer? *CCSS Reading 6*

## SPEAKING AND LISTENING

**Collaborate** What are your thoughts and opinions about brain chains and the use of lab animals in their developments? Do you feel science should continue researching this? Will the benefits outweigh the concerns? Hold a discussion with a small group of your classmates, expressing your own ideas and responding to each other's.

# ARTICLE: Greetings from Earth

Magazine pages 18-23, Expository Nonfiction



Humans have been searching for life beyond earth for quite some time. What is the best way to communicate with extra-terrestrials and how will we know if they are friend or foe? These questions and many more are handled by teams of scientists searching for messages and trying to communicate with extra-terrestrials.

## ESSENTIAL QUESTION

**How have scientific advancements changed the way we communicate?**

## CORE CONTENT CONCEPT

**Science** The uses of technologies and any limitations on their use are impacted by social values, the findings of scientific research, and economic conditions.

## CROSS-CURRICULAR EXTENSION

**Art** What symbols would you use to communicate a message to extra-terrestrials? Design a collage demonstrating what you feel might be effective “universal” symbols.

## KEY VOCABULARY

**transmissions (p. 19)** something (such as a message or broadcast) that is transmitted to a radio, television, etc.

**linguistics (p. 23)** the study of language and the way languages work

## PREPARE TO READ

Ask students to brainstorm a list of movies they've seen with aliens or extra-terrestrials as main characters. Explore the human (and Hollywood) fascination with life in other galaxies. Ask students to share what they would most like to ask an alien species, if they existed and students had the chance to meet them.

## CLOSE READING AND TEXT ANALYSIS

### Key Ideas

- Cite details from the text to support or refute this claim: Society has made great progress toward establishing communication with ETs. *CCSS Reading 1*
- Use details from the text to infer why listening for messages is as important (or even more important) as sending them. *CCSS Reading 1*
- Compare Carl Sagan and Hans Mark. How are they alike? How are they different? *CCSS Reading 3*

### Craft and Structure

- **Analyze Point of View** Scientists disagree on whether we should be messaging distant civilizations. Locate and list facts and other information in the article supporting each point of view. *CCSS Reading 6*
- **Analyze Text Structure** The text uses several different structures. Which structures does it use and how would your understanding of the content change if the author only used a chronological structure? *CCSS Reading 8*

## SPEAKING AND LISTENING

**Pitch a Movie Scene** Assume you are pitching a movie to Hollywood executives. You are to tell them about a pivotal scene when humans receive a message from an ET. What happens when we actually hear and receive a message from an ET? What will the message say? How will people respond? Write the scene in play format and practice pitching it to a partner.

# ARTICLE: Say What, Horse?

Magazine pages 32-35, Expository Nonfiction



People have been issuing verbal commands to horses for thousands of years. But scientists have only recently learned that horses are capable of communicating (albeit nonverbally) in return. Using knowledge gained by Norwegian scientists, we soon hope to be learning more about what horses really have to say!

## ESSENTIAL QUESTION

**How have scientific advancements changed the way we communicate?**

## CORE CONTENT CONCEPT

**Social Studies** All species have the ability to communicate.

## CROSS-CURRICULAR EXTENSION

**History** “Straight from the horse’s mouth” is an idiom meaning that one speaks the truth. Research the origins of this expression. Why is it appropriate for horses to be associated with this common communication phrase?

## KEY VOCABULARY

**domesticate (p. 33)** to breed or train (an animal) to need and accept the care of human beings

**pecking order (p. 33)** the way in which people or things in a group or organization are placed in a series of levels with different importance or status

**abstract (p. 34)** relating to or involving general ideas or qualities rather than specific people, objects, or actions

## PREPARE TO READ

Tell students to think of a feeling they can express using only facial features. Ask students to close their eyes and put the expression on their face. Then tell students to open their eyes and look around the room. Discuss the array of emotions displayed. Ask: Are pets capable of conveying the same emotions?

## CLOSE READING AND TEXT ANALYSIS

### Key Ideas

- Locate evidence from the text showing the trained horses’ moods after realizing they could communicate with the flashcards. *CCSS Reading 1*
- Infer what types of flashcards the horses might learn next. Support your inference with clues from the text. *CCSS Reading 1*
- Use information from the text to compare and contrast human and horse eyesight. *CCSS Reading 3*

### Craft and Structure

- **Interpret Visual Information** Analyze each photo. Use clues in the text to determine whether each person is communicating verbally, nonverbally, or both ways. *CCSS Reading 7*
- **Evaluate Evidence** Locate evidence throughout the text illustrating the point that horses are highly intelligent. Is the evidence sufficient to support this claim? *CCSS Reading 8*

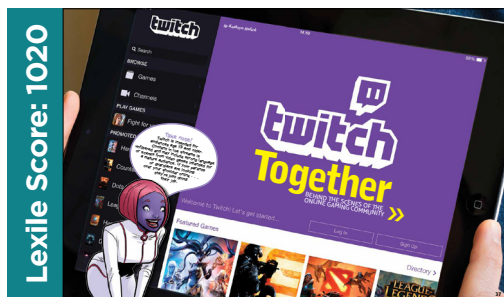
## WRITING

**Write a Fable** A fable is a short story—usually with an animal as a central character—that teaches a moral. Write a short fable in which a horse is the main character and the horse’s owner or rider learns something surprising about their horse friend.



# ARTICLE: Twitch Together

Magazine pages 36-41, Expository Nonfiction



Twitch is a website where people can observe online video gaming and communicate while either watching or playing. Twitch has not only connected people with common interests, but it's also built a community where people feel free to express themselves.

## ESSENTIAL QUESTION

**How have scientific advancements changed the way we communicate?**

## CORE CONTENT CONCEPT

**Science** The uses of technologies and any limitations on their use are impacted by social values, the findings of scientific research, and economic conditions.

## CROSS-CURRICULAR EXTENSION

**Career Planning** Would you like to become a professional gamer one day? Refer to the tips the gamers give to create a step-by-step plan you can start on now. Then expand it to what you can do in 1, 5, and 10 years.

## KEY VOCABULARY

**commentary (p. 38)** a spoken description of an event (such as a sports contest) as it is happening

**retro (p. 39)** looking like or relating to styles or fashions from the past

**rampant (p. 40)** growing quickly and in a way that is difficult to control

## PREPARE TO READ

Take a class poll. Ask: How many students have participated in online gaming? Allow those who have participated to summarize what online gaming is and why it is so appealing to them. Then ask students what might be interesting to some people about a website that allows them to watch others play games.

## CLOSE READING AND TEXT ANALYSIS

### Key Ideas

- List details in the text describing how the creators of Twitch encourage communication. *CCSS Reading 1*
- What is the overall theme of this article? How do you know? *CCSS Reading 2*
- How is Twitch similar to and different from YouTube? Use details in the text to support your answer. *CCSS Reading 3*

### Craft and Structure

- Evaluate Evidence** The author quotes someone who believes that Twitch allows people with social anxiety to “feel more in control of social situations online.” Is the evidence presented sufficient to support this claim? Why or why not? *CCSS Reading 8*
- Compare Texts** The author refers to people identified in the sidebars throughout the text. How do the attitudes toward Twitch presented in the text and the sidebars compare? *CCSS Reading 9*

## WRITING

**Create a Trading Card** The sidebars list information about each gamer in the fashion of a trading card. Use this format to design a card about yourself. Create a “game name” for yourself. List fun facts, a favorite game, favorite quote, and other important information.

## 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).

- This issue is entitled “Can We Talk?” But communication goes beyond basic verbal communication. It can be broken down into two major categories: verbal (talking and sounds) and nonverbal (body language and facial expressions). Gather information from across texts of people and animals using both types of communication. Create a T-chart labeled “Verbal Examples” and “Nonverbal Examples” to share what you learned.
- How do animals communicate and what can we learn from them? Read about marine biologist Denise Herzig’s work (magazine pages 28-30) and read “Say What, Horse?” (magazine pages 32-35). Apply what you learn in the articles to create a communication experiment for your own pet.
- Sometimes scientific discoveries meant for the common good can be dangerous at the same time. Compare information from multiple texts to gather examples of this idea and also think of additional examples. As a class, discuss how people could act to limit the negative impacts of new discoveries. Then, in small groups, make a pro and con T-chart and list both the good and the bad aspects of one of the discoveries in this issue.
- The articles and features throughout this issue either focus on humans communicating with nonhumans (interspecies communication) or humans communicating with other humans (intraspecies communication). As you read each article, label it “interspecies” or “intraspecies” communication. Discuss how the purposes differ, but also how both types of communication are equally important to science and society.
- Different forms of communication are used by humans and non-humans, from binary code to symbolic drawings and facial expressions. Gather information from “Greetings from Earth,” “Say What, Horse?” and “Guess What I’m Thinking” about different forms of communication. Then, create a poster illustrating different forms of communication and how they work.

## EXPLORATORY LEARNING - FLEXIBLE MINI-UNIT DESIGN

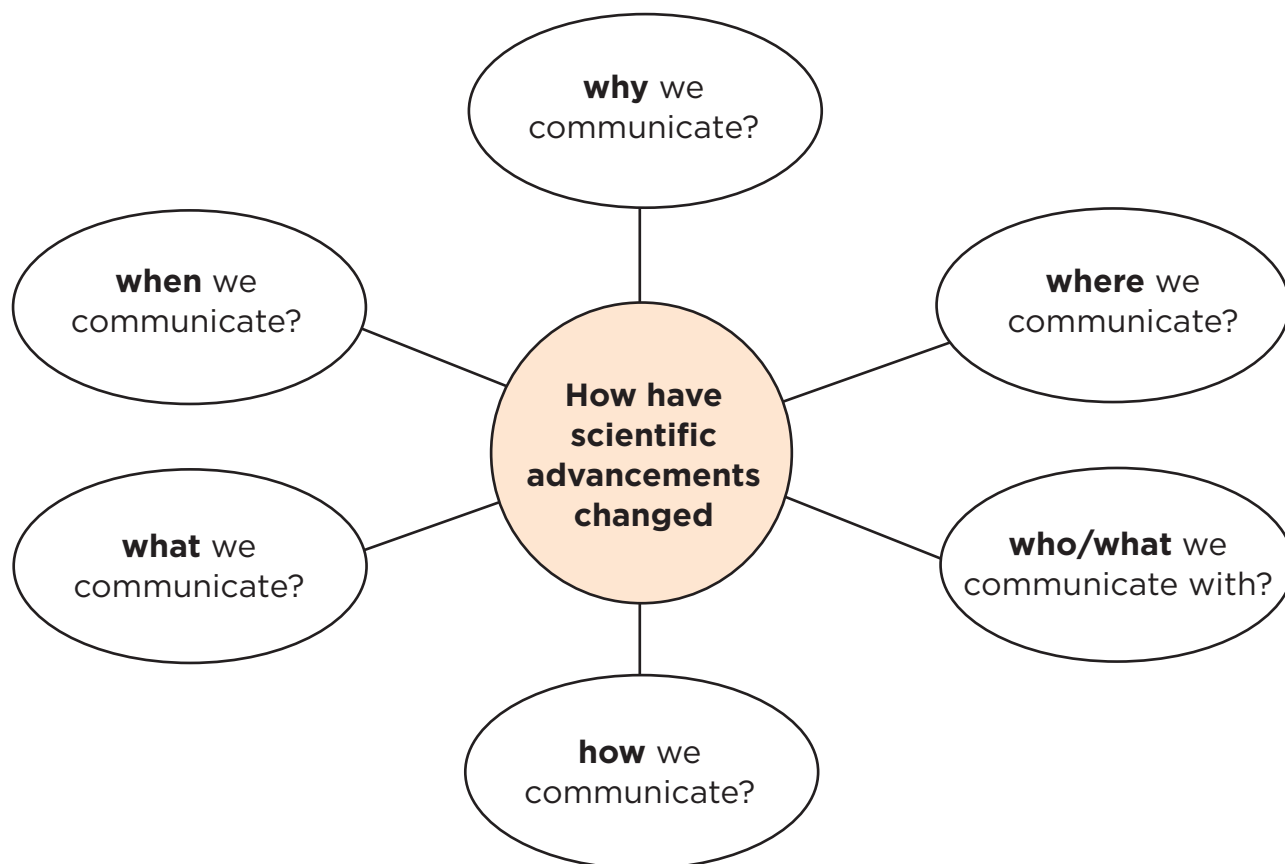
### ENGAGE

### READ FOR A PURPOSE

### APPLY

In this issue, students learn how different scientific advances have altered, and possibly improved, our ability to communicate. In the mini-unit, students will conduct research using the magazine articles and participate in small group discussions about communication. Then, in a class discussion, students will support their opinions about the state of communication today.

**ENGAGE:** Engage students in the topic of communication by focusing on the **Essential Question: How have scientific advancements changed the way we communicate?** Use the diagram below to guide students in a discussion about communication. Encourage students to use examples from their own lives, as well as the magazine, to answer the questions.



## READ FOR A PURPOSE

**INTRODUCE THE ACTIVITY: COMMUNICATION DISCUSSION** Explain to students that they will use the magazine articles to become “article experts” on how human communication has changed over time. They will then hold a class debate on the future of human communication. Inform them that the activity begins by revisiting articles, and then, in small groups, they’ll prepare a list of ideas to present to the class. Finally, all groups will come together and they will discuss and debate what the future of human communication may involve.

Divide the class into groups of five students. Within each group, assign one of the magazine articles to each member.

**RETURN TO THE TEXT:** Explain to students that before they can begin their group discussions, they need to conduct research using their assigned articles. Distribute a copy of the Communication Discussion graphic organizer (p. 13) to all students. Remind students that they will be working independently to fill in the graphic organizer. Tell students that they need to use information from the articles to answer questions 1 and 2. Continue by telling them that for question 3, they should use article information and their own ideas to predict possible effects.





**APPLY: COMMUNICATION DISCUSSION** Now that students have gathered information from the articles, they are ready to move on to the next phases of this activity: sharing information and discussing ideas.

**Materials**

- completed Communication Discussion graphic organizer (p. 14)
- writing paper
- pens or pencils

**STEP 1: Review Activity Steps**

- First, experts who have been assigned the same article will meet to discuss ideas and information.
- Next, experts will go back to their home groups. Group members will take turns presenting to each other the information they recorded in their Communication Discussion organizers. Other group members will listen attentively and then respond to the presentation with comments and questions.
- Finally, groups will draft a list of opinions on the future of human communication to share later in the activity.

**STEP 2: Meet with Experts** Have experts who have read the same article meet to share ideas and help each other prepare for their presentations. Experts might bring up any problems they encountered while answering questions. In addition, they can brainstorm possible questions that other members of their groups might ask them.

**STEP 3: Discuss in Groups** Have home groups reconvene to begin their presentations. Remind groups that they should ask questions and make comments after each member's presentation. Also remind them to listen attentively and show respect for other group members.

**STEP 4: List Opinions in Groups** After each member has presented, hold a group discussion about where the group thinks the future of human communication lies and why. Make a list of at least 3 statements or opinions expressing your beliefs, and support each statement with evidence from the articles.

**STEP 5: Class Debate** Invite all groups to come together. Instruct each group to appoint one individual to read aloud their statements/opinions and supporting evidence. Once each group has presented, invite all students to share their perspectives on what was said. Do they agree with everyone? Is there anything in particular they disagree with? Serve as a moderator, ensuring that the maximum number of students get to participate.



NAME: \_\_\_\_\_

## COMMUNICATION DISCUSSION GRAPHIC ORGANIZER

Article title \_\_\_\_\_

Main topic \_\_\_\_\_

1. How has this form of communication been affected by scientific advances?

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2. Where are we headed with this form of communication?

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3. How might this form of communication affect life in the future?

List 2-3 Positive Effects

List 2-3 Negative Effects

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## 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
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### KEY IDEAS AND DETAILS

<b>Read closely to determine what a text says explicitly.</b>	Reading 1	
<b>Make logical inferences</b> to determine what the text communicates implicitly.	Reading 1	
<b>Cite specific textual evidence to support conclusions</b> drawn from the text.	Reading 1	
<b>Determine central ideas or themes</b> of a text and analyze their development.	Reading 2	
<b>Summarize key supporting details and ideas.</b>	Reading 2	
Analyze how <b>individuals, events, and ideas develop and interact</b> over the course of a text.	Reading 3	

### CRAFT AND STRUCTURE

<b>Interpret words and phrases</b> as they are used in a text.	Reading 4	
<b>Determine technical, connotative, and figurative meanings.</b>	Reading 4	
Analyze how specific <b>word choices</b> shape meaning or tone.	Reading 4	
Analyze the <b>structure of texts</b> (sequence, cause/effect, compare/contrast, problem/solution)	Reading 5	
Recognize the <b>genre, key elements, and characteristics</b> of literary texts.	Reading 5	
Assess how <b>point of view or purpose</b> shapes the content and style of a text.	Reading 6	
Analyze how an <b>author's style and tone</b> affects meaning.	Reading 6	

### INTEGRATION OF KNOWLEDGE AND IDEAS

<b>Integrate and evaluate content</b> presented in diverse media and formats.	Reading 7	
<b>Identify and evaluate the argument and claims</b> in a text.	Reading 8	
<b>Analyze how two or more texts address similar themes or topics.</b>	Reading 9	

### WRITING

Write <b>arguments</b> to support claims, using valid reasoning and relevant and sufficient evidence.	Writing 1	
Write <b>informative/explanatory texts</b> to examine and convey complex ideas and information clearly and accurately.	Writing 2	
Write <b>narratives</b> to develop real or imagined experiences or events.	Writing 3	
<b>Draw evidence</b> from literary or informational texts to support analysis, reflection, and research.	Writing 9	
Conduct short as well as more sustained <b>research projects</b> .	Writing 10	





# CORE INSTRUCTIONAL CONCEPTS: SOCIAL STUDIES

## C3 INQUIRY ARC DIMENSION 2: APPLYING DISCIPLINARY CONCEPTS AND TOOLS

## STATE OR DISTRICT STANDARD

### CIVICS

Analyze the <b>origins, functions, and structure of different governments</b> and the <b>origins and purposes of laws</b> and key constitutional provisions.	
Summarize core <b>civic virtues and democratic principles</b> .	
Evaluate <b>policies</b> intended to address social issues.	

### ECONOMICS

Evaluate the <b>benefits and costs of individual economic choices</b> .	
Analyze <b>economic incentives</b> , including those that cause people and businesses to specialize and trade.	
Explain the <b>importance of resources</b> (i.e. labor, human capital, physical capital, natural resources) in <b>methods of economic production</b> .	
<b>Explain</b> the <b>functions of money</b> in a market economy.	
<b>Explain</b> the importance of <b>competition</b> in a market economy.	
Apply economic concepts (i.e. interest rate, inflation, supply and demand) and theories of <b>how individual and government actions affect the production of goods and services</b> .	
<b>Analyze economic patterns</b> , including activity and interactions between and within nations.	

### GEOGRAPHY

<b>Construct and use maps</b> and other graphic representations (i.e. images, photographs, etc.) of different places.	
<b>Explain cultural influences</b> on the way people live and modify and adapt to their environments.	
<b>Analyze places, including their physical, cultural and environmental characteristics</b> and how they change over time.	
Analyze <b>movement of people, goods, and ideas</b> .	
<b>Analyze regions, including how they relate to one another</b> and the world as a whole from a political, economic, historical, and geographic perspective.	

### HISTORY

Interpret historical context to <b>understand relationships among historical events or developments</b> .	
Evaluate historical events and developments to identify them as <b>examples of historical change and/or continuity</b> .	
<b>Analyze perspectives</b> , including factors that influence why and how individuals and groups develop different ones.	
<b>Evaluate historical sources</b> , including their reliability, relevancy, utility, and limitations.	
<b>Analyze causes and effects</b> , 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

