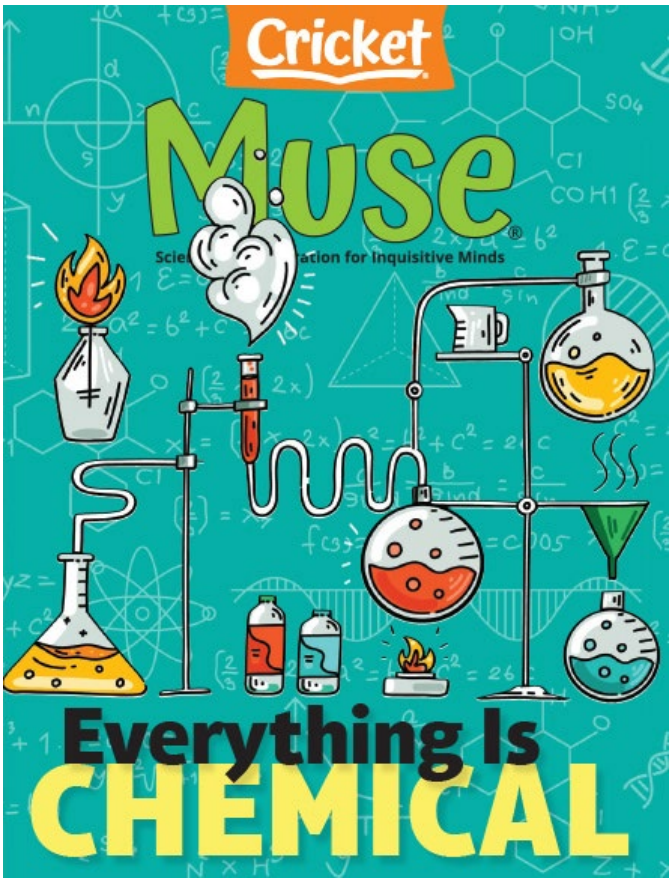
Muse® Teacher Guide: March/April 2025

Muse®

Everything is Chemical

From the air we breathe to the food we eat, chemical reactions are making things happen all around us. These reactions create a state of constant flux that generates astonishing consequences for humankind. This issue of MUSE magazine promises that readers will undergo some changes of their own as they gain scientific insight into the transformative world in which we live.



CONVERSATION QUESTION

How do chemical reactions affect our daily life?

TEACHING OBJECTIVES

- **Students will learn how human interactions directly affect our air quality.**
- **Students will learn how new medicines become available to treat the sick.**
- **Students will learn about the physical and chemical changes that transpire during the bread making process.**
- **Students will analyze cause and effect relationships.**
- **Students will explain and sequence a studied process.**
- **Students will examine structure and function.**
- **Students will conduct research to further their understanding of the topic.**
- **Students will explore the healing methods of early cultures.**
- **Students will convert information into visual data by creating a graph.**

In addition to supplemental materials focused on core STEAM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **The Air Around Us**
Expository Nonfiction, 770L
- **Making Medicine**
Expository Nonfiction, 940L
- **The Magical Transformation of Bread**
Expository Nonfiction, 820L

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The Air Around Us

pp. 24–27, Expository Nonfiction

Breathe in. . . .Breathe out. . . .Students will learn how air quality is affected by human interactions and what can be done to keep the environment healthy.

RESOURCES

Cause and Effect: Take a Deep Breath

OBJECTIVES

- Students will learn how human interactions directly affect the air quality.
- Students will analyze cause and effect relationships.
- Students will conduct research to further their understanding of the topic.

KEY VOCABULARY

- ***index* (p. 26)** an indicator or measure of something
- ***radiation* (p. 26)** emission of energy transmitted in particles
- ***regulations* (p. 26)** rules made and maintained by an authority

ENGAGE

Conversation Question: How do chemical reactions affect daily life?

Motivate students to read the article by guiding a short breathing exercise/meditation such as the 4-7-8 method as follows: **1.** Inhale through your nose for a count of four. **2.** Hold the breath for a count of seven. **3.** Exhale through your mouth for a count of eight. (This is a great exercise for students seeking stress-relief or relaxation.) Have them focus on their breathing. Following the activity, discuss how particles in the air will affect how healthy these breaths are. Introduce the article, "The Air Around Us."

INTRODUCE VOCABULARY

Post and discuss the key vocabulary terms. Provide groups of students with actual Scrabble tiles, or print out a letter/value sheet online. Have students list the point value for each word and total the sum. Then, instruct them to put the four words in order from lowest value to highest value. During a quiet period allow students to search the entire MUSE issue to locate and define the word that has the highest point value.

READ & DISCUSS

Reinforce comprehension of the concepts in this article by using the following prompts to direct discussion.

1. What are the components that make up the air that we breathe?
2. How do human interactions cause harmful imbalances in our environment?
3. What is energy poverty?
4. What causes "dirty air?"
5. How can individuals and society as a whole protect the air?

SKILL FOCUS: Cause and Effect

INSTRUCT: Lead students in a discussion that guides them to recognize the many cause and effect relationships that are studied in the article. Introduce the graphic organizer, *Take a Deep Breath*, and tell the class that they will be searching through the article for such relationships. They will also need to record whether each relationship is harmful or helpful to our Earth and the air that we breathe.

ASSESS: Evaluate students' work on the chart. Arrange peer groups if remediation is necessary.

EXTEND

Language Arts Give the class the opportunity to research the air quality index where they live at www.airnow.gov (p. 26). Have them locate regions with contrasting indexes. Instruct the class to conduct brief research to explore why a particular area may have a high or low index. Students can choose to write a short essay or construct a detailed drawing comparing and contrasting the conditions of the regions. Remind students that they must provide clear and accurate reasons for the differences and similarities.

Take a Deep Breath

Cause and Effect Review the article to locate cause and effect relationships. In the last column, indicate if the relationship is helpful or harmful.

Page Number	Cause/Behavior	Effect/Result	Helpful/Harmful
p. 25	Nitrogen-based fertilizers to grow crops	Unbalanced nitrogen levels create pollution.	Harmful

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Making Medicine

pp. 32–36, Expository Nonfiction

Although modern medicine may appear to be a miracle, making a successful drug is a lengthy and difficult process. Readers will learn about the people, the compounds, and the procedures that are responsible for healing the sick.

RESOURCES

Sequence a Process: Clinical Testing

OBJECTIVES

- Students will learn how new medicines become available to treat the sick.
- Students will explain and sequence a studied process.
- Students will explore the healing methods of early cultures.

KEY VOCABULARY

- ***culprits* (p. 33)** the causes of a problem or defect
- ***rogue* (p. 33)** a thing that behaves in a faulty or unpredictable way
- ***scour* (p. 33)** to thoroughly search in order to locate something
- ***tweak* (p. 34)** to improve by making fine adjustments

ENGAGE

Conversation Question: How do chemical reactions affect daily life?

Use a K-W-L chart (Know-Want to Know-Learned) to record students' prior knowledge about how medicines are made, as well as what they would like to know about this process. Return to the chart after the completion of the reading/learning activities and have students add details about what they have learned. If there are remaining curiosities, allow the class to use books and the internet to find more information.

INTRODUCE VOCABULARY

Display the following statements and underline the key vocabulary terms. Review how to infer the meanings of new words by using context clues and background knowledge. Then have partners work together (or complete as a class) to determine the meaning of each word. Reveal definitions.

- There were never any fingerprints or hair that led to the culprits.
- Over time, winds and rogue waves washed away the seemingly habitable island.
- Anthony scoured the internet looking for an affordable hotel.
- Diane tweaked the recipe to give the soup more flavor.

READ & DISCUSS

As a post-reading activity, lead a discussion based on the following questions:

1. What are some of the reasons that people get sick?
2. What happens during the preclinical step of medicine-making?
3. How was the pain and fever reducer, aspirin, created through "trial and error?"
4. Why is clinical testing so important?
5. What is the function of the Food and Drug Administration (FDA)?

SKILL FOCUS: Sequence a Process

INSTRUCT: The article reveals that there are three main steps in the process of clinical testing new medications. Instruct the students to use the graphic organizer, *Clinical Testing*, to demonstrate their understanding of each phase of the trials. Emphasize the importance of proper sequence and be sure that students can verbalize their understanding of the process in their own words.

ASSESS: Circulate as students are working. Pose the question: *What would happen if one of the steps was omitted?*

EXTEND

STEAM There is evidence that even the most primitive ancient civilizations attempted to produce cures for the ills of their people. Assign students different areas of the world. Have them locate the region on a map and research the early medicines used by cultures that lived in that area during a specific time period. Combine their completed research into a class book to be kept in the reading center.

Clinical Testing

Sequence a Process Reread the article and highlight sentences that detail the steps of clinical testing. Explain each step of the process and include the timeframe.

STEP 1:

STEP 2:

STEP 3:

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The Magical Transformation of Bread

pp. 40–44, Expository Nonfiction

This article will take the reader on a journey through the transformative process of bread making. Students will learn about the many chemical and physical changes that basic ingredients must undergo to create this wholesome dietary staple.

RESOURCES

Structure and Function: Do You Know the Muffin Man?

OBJECTIVES

- Students will learn about the physical and chemical changes that transpire during the bread making process.
- Students will examine structure and function.
- Students will display data visually by creating a graph.

KEY VOCABULARY

- ***network*** **(p. 42)** a group of interconnected things
- ***transformer*** **(p. 42)** something that changes in form, appearance, or structure
- ***compounds*** **(p. 44)** something composed of two or more separate elements; a mixture

ENGAGE

Conversation Question: How do chemical reactions affect daily life?

Give students a few minutes to discuss with their classmates what they ate for breakfast and lunch. Generate a list on the board and note the number of times certain food items were eaten. Prompt students to notice how many of the items are bread-based. Pose the question: *Why do you think bread is incorporated into so many meals?* Introduce the article, "The Magical Transformation of Bread."

INTRODUCE VOCABULARY

Post and review the three vocabulary words. Inform students that all of these terms can be found in the article, "The Magical Transformation of Bread." Have them use the title and the vocabulary terms to predict the content of the article. Revisit the predictions after the reading and challenge students to write a brief summary of the article, incorporating all three words.

READ & DISCUSS

Pose the following questions to facilitate meaningful discussion.

1. What are the four ingredients needed to make bread?
2. How does the "magical transformation" of bread occur?
3. Why does bread need salt?
4. Read the "Baking Better Bread" text box on page 43. What work is being done in the Bread Lab at Washington State University?
5. How does bread get stale?

SKILL FOCUS: Structure and Function

INSTRUCT: Review the physical and chemical changes that occur when combining the four basic ingredients needed to make bread. Present the *Do You Know the Muffin Man?* chart and tell students that they will be using information from the article to record the function of each structure listed. Students may work in pairs to complete the organizer.

ASSESS: Review the worksheet as a class. Have different pairs of students share aloud one of the eight structures and its function.

EXTEND

Mathematics Have the students brainstorm a list of different types of bread (white, whole wheat, Italian, croissants, etc.) Inform them that they will work in small groups to survey other members of the class/grade, inquiring about their favorite type of bread, using tally marks to record repeats. They will use the survey to create a graph depicting the data. Discuss why the following three graphs (bar graph, line graph, pie chart) could be used effectively for this purpose. Allow students to select one of the three types and complete their graph. Remind students that all graphs must include a title, a consistent scale, and accurate data points. Display finished graphs.

Do You Know the Muffin Man?

Structure and Function Refer to the article to study the structure and function of each element involved in bread making.

Structure	Description	Function
flour		
salt		
yeast		
water		
glutenin		
gliadin		
starch