Muse® Teacher Guide: March 2023



Incredible Journeys

Traveling thousands of miles by land, air, or sea, millions of animals set out on an epic migratory journey in search of food, shelter, and mating opportunities. This month's issue of MUSE magazine explores how animals navigate their surroundings and examines how human interaction can serve to either hinder or support their passage.

CONVERSATION QUESTION

How do animals navigate the world?

TEACHING OBJECTIVES

- Students will learn about the gray whale's migratory journey and its long path to recovery.
- Students will learn how different animals use their special senses to navigate the world.
- Students will learn how experts are working to make busy roadways safer for animals to cross.
- Students will examine sequence and process.
- Students will construct explanations.
- Students will collect evidence to support claims.
- Students will use information from the text to solve and create mathematical theme-based word problems.
- Students will make maps and plot simple routes.
- Students will participate in an engineering building challenge.



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

SELECTIONS

- The Epic Journey Expository Nonfiction, ~1070L
- Secrets of Animal Navigators Expository Nonfiction, ~1040L
- Critters Crossing!Expository Nonfiction, ~990L

The Epic Journey

pp. 14–18, Expository Nonfiction

Population recovery has made the Pacific gray whale the only marine mammal ever to be removed from the endangered species list. Readers will accompany these majestic animals on their yearly migratory journey.



RESOURCES

 Sequence and Process: A Whale Tale

OBJECTIVES

- Students will learn about the gray whale's migratory journey and its long path to recovery.
- Students will examine sequence and process.
- Students will use information from the text to solve and create themebased word problems.

KEY VOCABULARY

- conservation (p. 16) the protection of animals, plants, and natural resources
- subsistence hunting (p. 16) hunting for survival or only killing what is needed to survive

ENGAGE

Conversation Question: How do animals navigate the world?

Distribute the article and read aloud the title: "The Epic Journey." Give students a few minutes to preview the photographs, captions, and subheadings. Then instruct students to view the map on page 17, which shows the migration route of the Pacific gray whale. Ask students this question: What are some of the dangers you think the whales would face during their annual migration of more than 10,000 miles?

INTRODUCE VOCABULARY

Post and discuss the two vocabulary words and definitions. Have students Think-Pair-Share with a partner. Give them the following directives, one at a time:

- How can we help to ease the climate crisis of global warming by being part of **conservation** efforts? Give examples.
- What is the difference between **subsistence hunting** and hunting for sport?

Have students highlight the key terms in the article.

READ & DISCUSS

Pose the following questions to prompt meaningful discussion. Students should use complete sentences and details to answer each question.

- 1. Why is the Pacific gray whale's story one of the world's greatest conservation stories?
- 2. Explain the complicated relationship between humans and whales.
- 3. What resources have whales been hunted for throughout history?
- 4. How did the advent of the steamship and the explosive harpoon change the whaling industry?
- 5. What is the significance of the 1975 Endangered Species Act?

SKILL FOCUS: Sequence and Process

INSTRUCT: This article presents the reader with detailed information regarding the migratory journey of the Pacific gray whale. Distribute the *Sequence and Process: A Whale Tale* graphic organizer. Tell students they will use it to record details that explain the experiences of the Pacific gray whales during each season of their long, arduous swim.

ASSESS: Instruct students to exchange completed worksheets with a partner and give each other feedback. Discuss each season.

EXTEND

Mathematics: Page 17 of the article states that the whale migration will take about two months and cover 5,000 miles. Have students use the R-D-W (Read-Draw-Write) process to answer the following question: *Approximately how many miles do the whales travel each week?* (Answer: 625 miles) This article contains a multitude of mathematical information: mileage, weights, dates, etc. Challenge students to create their own theme-based word problems for a classmate to solve.

A Whale Tale

Sequence and Process Record information from the article outlining each season of the gray whale's journey. Include details.



Secrets of Animal

Navigators

pp. 24–26, Expository Nonfiction

By land, sea, and air, animals use amazing sensory abilities to traverse their surroundings. This article examines a variety of animal navigational tools and methods.



RESOURCES

 Construct Explanations: Lost and Found

OBJECTIVES

- Students will learn how different animals use their special senses to navigate the world.
- Students will construct explanations.
- Students will make maps and plot simple routes.

KEY VOCABULARY

- nocturnal (p. 25) occurring, done, or active at night
- echolocation (p. 26) a technique used by bats, dolphins, and other animals to locate objects by reflected sound

ENGAGE

Conversation Question: How do animals navigate the world?

Have the class help you create a master list of navigational tools and methods used by humans. Then ask students which senses and tools they would use in different circumstances, such as to locate a hospital, a bus station, the school cafeteria, and the door in a dark room. Discuss why different tools/senses are needed to locate the different places.

INTRODUCE VOCABULARY

Post and read aloud the vocabulary words. Explain that knowing the meanings of word parts can help students guess the meaning of new words.

- Explain that many scientific terms contain Greek and Latin word parts. Break apart the word *nocturnal* to show the meanings of its parts: **noct-** = night / **-urnal** = of time. Then compare to the definition.
- Explain that a compound word is made by combining two existing words to form a new word. Break apart the word *echolocation* and show the meanings of its parts: **echo** = repeated sound / **location** = position or place. Then compare to the definition.

READ & DISCUSS

Reinforce comprehension of the concepts presented in the article by using the following questions to direct discussion:

- 1. How did scientists confirm that sharks navigate using magnetic fields?
- 2. What is cryptochrome?
- 3. How do scientists think cryptochrome helps birds with direction?
- 4. What senses do humans use to navigate their surroundings?
- 5. How precise is echolocation as a navigational tool?
- 6. Why are humans the greatest obstacle to animal navigation?

SKILL FOCUS: Construct Explanations

INSTRUCT: Students will construct explanations to demonstrate their understanding of the various tools and methods animals use to navigate. Have students work in pairs to reread the article and discuss relevant content. Then distribute the *Construct Explanations: Lost and Found* worksheet, and have students complete it.

ASSESS: Have students turn and talk with a partner to discuss the question in the Think Tank. Review the worksheet as a whole class.

EXTEND

Geography: Tell students they are going to become cartographers, or map makers, to help new students become familiar with the layout of the school building and grounds. Have students work in groups, and assign a different map to each group. For example, one group could make a map showing the route from the main school entrance to the gym. Other groups could make maps showing the route from the entrance to the cafeteria, the nurse's office, the library, etc. Emphasize the importance of accuracy. Bind the maps together and leave in the main office as a reference for new students.

Lost and Found

Construct Explanations Refer to the article to locate information that explains how animals use each of the elements listed below as navigational tools. Provide examples.

Element	How does it assist in animal navigation?
sun/stars	
magnetism	
landmarks	
counting	

Think Tank: Think about other special senses/abilities that animals use to navigate. Discuss with a partner.

Critters Crossing!

pp. 42–45, Expository Nonfiction

Transportation ecology is an emerging science that considers how natural and built environments interact. Readers will learn how engineers are using this new science to create safe roadway crossings for wildlife.



RESOURCES

 Collecting Evidence: Save the Animals!

OBJECTIVES

- Students will learn how experts are working to make busy roadways safer for animals to cross.
- Students will collect evidence to support claims.
- Students will participate in an engineering challenge.

KEY VOCABULARY

- overpass (p. 44) a bridge built over a highway that allows wildlife to safely cross a busy road by going above it
- underpass (p. 44) a tunnel built under a highway that allows wildlife to safely cross a busy road by going underneath it

ENGAGE

Conversation Question: How do animals navigate the world?

Distribute the article "Critters Crossing!" As a prereading activity, show the class one of the many online videos of different types of animals using a wildlife overpass to cross a road. It is a majestic sight to see such a movement of animals safely traversing busy roadways. Discuss how the balance between humans and animals has been disrupted and how humans are attempting to improve the situation.

INTRODUCE VOCABULARY

Post and discuss the vocabulary terms. Be sure students understand what each structure looks like by having them preview the photos in the article. Next, have students fold a piece of paper in half, label the boxes with the key words, and make a visual representation of each structure. After reading the article, students will use information from the text to add details to their drawings. Emphasize the key terms in the reading.

READ & DISCUSS

Read the article aloud with the class. Have students reread the article in small groups to answer the questions below. Share responses.

- 1. What are some reasons why animals move from place to place?
- 2. How have highway engineers traditionally addressed the problems between transportation systems and habitat corridors?
- 3. What is transportation ecology?
- 4. How do engineers decide what materials and structures are most suitable for a crossing?
- 5. What are the future plans concerning wildlife crossings?

SKILL FOCUS: Collect Evidence

INSTRUCT: This article presents readers with detailed information about the wildlife crossing structures that are being built worldwide. Distribute the *Collecting Evidence: Save the Animals!* worksheet. Instruct students to review the article and highlight details that provide evidence to support each of the claims listed on the worksheet. After they have collected evidence addressing all of the statements, they will record the information on the worksheet and cite it.

ASSESS: Collect and review worksheet to assess the students' ability to collect supporting evidence.

EXTEND

Engineering: Make a connection to the article by presenting a STEM building activity. Supply students with a bowl of gumdrops and a box of toothpicks. Allow them time to experiment joining the materials, with gumdrops serving as the connectors. Challenge pairs of students to either build the highest tower or the strongest bridge. Circulate as students are working and initiate dialogue. Pose questions such as: *What makes the bridge strong? How can you build your tower higher? What part of the structure holds the most weight?*

Save the Animals!

Collecting Evidence Gather evidence from the text to support each claim. Include details and examples. Cite your findings using page numbers.

Claim: Designing effective crossings begins by understanding where wildlife would cross naturally.	
Supporting evidence (P)	
Claim: Selecting the best structure depends on understanding species' behavior.	
Supporting evidence (P)	
Claim: For the future, transportation ecologists are developing new methods to make wildlife crossings effective and affordable.	
Supporting evidence (P)	