Muse® Teacher Guide: February 2023



Into Space

Humans have studied and admired the stars since the beginning of time. Modern space exploration allows us to prove and disprove theories created on Earth. This month's issue of MUSE invites students to work alongside scientists to study current space missions.

CONVERSATION QUESTION

How are scientists learning about space?

TEACHING OBJECTIVES

- Students will learn how scientists are searching for evidence of ancient extraterrestrial life on Mars.
- Students will learn about the experiences of students attending Space Camp.
- Students will learn how the scientific community is contending with asteroids headed for Earth.
- Students will construct explanations.
- Students will collect evidence to support a claim.
- Students will examine the problem-and-solution relationship.
- Students will track the movement and discoveries of the Perseverance rover.
- Students will plot locations on a map of the United States and calculate distances.
- Students will use logic to solve a problem.



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

- Looking for Life on Mars Expository Nonfiction, ~980L
- Lift Off at Space Camp Expository Nonfiction, ~920L
- Mission: Asteroid Crash Expository Nonfiction, ~ 960L

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Looking for Life on Mars

pp. 16–18, Expository Nonfiction This article invites readers to assist NASA in its quest to discover signs of ancient life on Mars. Students will learn about the scientists and the technology that are making this search possible.



RESOURCES

 Construct Explanations: Mission Accomplished

OBJECTIVES

- Students will learn how scientists are searching for evidence of ancient extraterrestrial life on Mars.
- Students will construct explanations.
- Students will track the movement and discoveries of the Perseverance rover.

KEY VOCABULARY

- delta (p. 17) a flat, low-lying, triangular landform made up of sediments deposited where a river flows into a lake or ocean
- *astrobiologist* (p. 17) a scientist who studies the possibility of life in the universe, beyond Earth

ENGAGE

Conversation Question: What are scientists learning about space?

Display the article title and tell students they will be reading about the Perseverance rover's search for early extraterrestrial life on Mars. Have students contemplate why the rover is named Perseverance. Then supply the dictionary definition of *perseverance*: "continued effort to do something despite difficulty or delay in achieving success." Ask students to share situations in which they have shown perseverance.

INTRODUCE VOCABULARY

Post the key terms and discuss the definitions. Then display the following questions and have students supply the correct answers.

- 1. What might prevent a **delta** from forming?
- a) sediment b) strong waves c) heavy silt d) saltwater
- 2. What might an astrobiologist need to study?
- a) tornadoes b) poetry c) astrology d) astronomy

Share answers aloud and have students explain their reasoning.

READ & DISCUSS

Pose the following questions to prompt meaningful discussion. Students' answers should use complete sentences and text details.

- 1. What is the mission of the Perseverance rover?
- 2. What are astrobiologists searching for on Mars?
- 3. Explain two ways that organic compounds can be made.
- 4. Why does research scientist Sunandra Sharma say her research is similar to detective work?
- 5. Why do scientists use a twin of SHERLOC on earth?

SKILL FOCUS: Construct Explanations

INSTRUCT: Students will construct explanations that demonstrate their understanding of how each component of the Perseverance rover is contributing to its mission. Have students work in pairs to reread the article and discuss relevant content. Distribute the *Construct Explanations: Mission Accomplished* graphic organizer and have students complete the worksheet independently.

ASSESS: Have students use information from the chart to write a brief summary explaining how scientists collect and analyze the data conveyed by the technologies listed.

EXTEND

Science In December 2022, NASA's Perseverance rover collected its first sample on the surface of the Mars. This is exciting news for the scientists and could potentially revolutionize humanity's understanding of Mars. Have students visit the NASA website (Mars Exploration Program) so that they can see the actual footage and track the movements of the Perseverance. Students can sign up on their phones or computers to receive updates about the mission.

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Mission Accomplished

Constructing Explanations Review the article and locate passages that discuss the importance of each of the components listed below. Use text details to explain how each one is an integral part of the Perseverance rover's mission to collect and analyze rock and soil samples from Mars.



http://www.cricketmedia.com/teacher-guides

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Lift Off at Space Camp

pp. 24–27, Expository Nonfiction

3... 2... 1... LIFT OFF! Readers will learn how Space Camp experiences are inspiring kids and teens to enter the aerospace field.



RESOURCES

• Collect Evidence: Flying High

OBJECTIVES

- Students will learn about the experiences of students attending Space Camp.
- Students will collect evidence to support a claim.
- Students will plot locations on a map of the United States and calculate distances.

KEY VOCABULARY

- facets (p. 26) parts or elements of something
- aerospace (p. 26) an industry that deals with travel in and above the Earth's atmosphere and with the production of vehicles used in such travel
- simulated (p. 27) made to look, feel, or behave like something; not real

ENGAGE

Conversation Question: What are scientists learning about space?

Ask students a few general questions about their interests, for example, Who likes to read in their downtime? Who is passionate about soccer? Who likes to cook? Who enjoys spending time with animals? Acknowledge that shared interests can build relationships. Tell students they are going to read an article about a group of kids who "found their pod" at Space Camp.

INTRODUCE VOCABULARY

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

- 1. Discuss different **facets** of your personality.
- 2. What job in the aerospace field is most interesting to you?
- 3. How could you simulate the experience of a roller coaster ride?

READ & DISCUSS

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

- 1. How is Space Camp different from a typical camp?
- 2. Explain Rocket City's connection to America's space program.
- 3. What can you see inside the recreated International Space Station?
- 4. How do Space Camp activities differ by age?

SKILL FOCUS: Problem and Solutions

INSTRUCT: This article presents the reader with information about the experiences of Space Camp. Present the *Collect Evidence: Flying High* worksheet. Explain to students that they will review the article and highlight sentences that provide evidence to support each of the claims stated on the worksheet. Remind students to be thorough and to cite information and details using page numbers.

ASSESS: Have mini-conversations as students are working. Collect worksheets.

EXTEND

Geography Have pairs of students use a map of the United States to plot the location of each space attraction listed below. Then have them calculate the distance between their town/city and each place. Finally, have them answer this question: "Which of these out-of-this-world places is closest to your home?"

- Kennedy Space Center Visitor Complex, Merritt Island, Florida
- Space Center Houston, Houston, Texas
- Moonshot Museum, Pittsburgh, Pennsylvania
- San Diego Air & Space Museum, San Diego, California

Flying High

Collect Evidence Gather evidence from the article to support each claim in the chart below. Include text details and cite your findings by using page numbers.

Claim: "Space Camp has a universe of adventures for every kid."
Supporting evidence (P)
Quite (NA/ith suit lassing Forth, Conse Complia the algorithmen and the heirs of estremout "
Claim: "Without leaving Earth, Space Camp is the closest you can get to being an astronaut."
Supporting evidence (P)
Claim: "Yes, Space Camp can be fun and games. But it's also realistic and challenging."
Supporting evidence (P)

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Mission: Asteroid Crash

pp. 42-45, Expository Nonfiction

This article goes beyond "wait-and-see" to explore the options NASA has at its disposal to avoid an asteroid's catastrophic collision with Earth.



RESOURCES

 Problem and Solutions: Save the Earth

OBJECTIVES

- Students will learn how the scientific community is contending with asteroids headed for Earth.
- Students will examine the problemand-solution relationship.
- Students use logic to solve a problem.

KEY VOCABULARY

- *vaporize* (p. 43) to change into a vapor, or gas, or to cause something to change into a gas
- jarring (p. 43) startling or unsettling
- ejecta (p. 44) material that is forced out, especially as a result of meteoric impact, stellar explosion, or volcanic eruption

ENGAGE

Conversation Question: How are scientists learning about space?

Distribute "Mission: Asteroid Crash" and tell students they are going to learn about how NASA deliberately collided a spacecraft into an asteroid. Have students turn to page 45 to examine the scale drawings at the bottom of the page. What information can be obtained? Why is it helpful, particularly in science articles, to provide the reader with this type of graphic?

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 to determine the meaning of each word. Reveal definitions.

- 1. The fire's high heat caused water from the fire hoses to vaporize.
- 2. Uncle Joe hates flying and finds the idea of it quite jarring.
- 3. The volcano's ejecta included gas, ash, and other particles.

Emphasize the key words in the reading.

READ & DISCUSS

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

- 1. What are PHOs and why are observatories worldwide tracking all known PHOs?
- 2. How does momentum affect kinetic impaction?
- 3. Explain the mission of the Double Asteroid Redirection Test (DART).
- 4. Why did engineers stop guiding DART four hours before the scheduled impact time?
- 5. What criteria deemed DART a success?

SKILL FOCUS: Problem and Solutions

INSTRUCT: Have students work in pairs to reread the article and highlight passages that explain how the problem of large extraterrestrial objects hurtling toward Earth is being solved. Distribute copies of the *Problem and Solutions: Save the Earth* graphic organizer. Tell students they will record and explain the solutions to the problem.

ASSESS: Collect the worksheets to evaluate the students' ability to clearly identify and explain solutions. Ask students to discuss how advancements in technology are both harming and helping the earth.

EXTEND

Logic: Have students brainstorm other situations where collisions must be avoided (transportation, sports, etc.). Encourage students to use ideas from the article to outline steps that could be taken to improve a potentially disastrous situation. Have them consider both human and technological diversions. Students can work with a group or independently. Invite volunteers to share their work.

Save the Earth

Problem and Solutions Refer to the article to learn how large space objects can be a threat to Earth. Use text details to explain solutions the scientific community is developing to address this danger.

