# muse®

Road Trip

Take a journey into this month's issue of MUSE magazine and explore uncharted territory. Readers will enjoy learning about exciting advancements in technology that are making crewless vehicles a possibility in our immediate future. Are we willing to relinquish the control and ready to deal with the consequences?

CONVERSATION QUESTION

How is technology changing how humans and packages are traveling over distances?

TEACHING OBJECTIVES

- **Students will learn how cars of the future will rely on alternative energy sources.**
- **Students will learn how unmanned aerial vehicles may change the way packages are delivered.**
- **Students will learn about the numerous ethical dilemmas surrounding the self-driving car.**
- **Students will compare and contrast the efficiency of vehicles with different power sources.**
- **Students will study the sequence and process of the drone delivery system.**
- **Students will explore the problems and the possible solutions regarding driverless cars.**
- **Students will write a persuasive essay that advocates for the use of either electric or hybrid vehicles.**
- **Students will practice mathematical conversions using both standard and metric measurements.**
- **Students will create and administer an ethics-based quiz.**
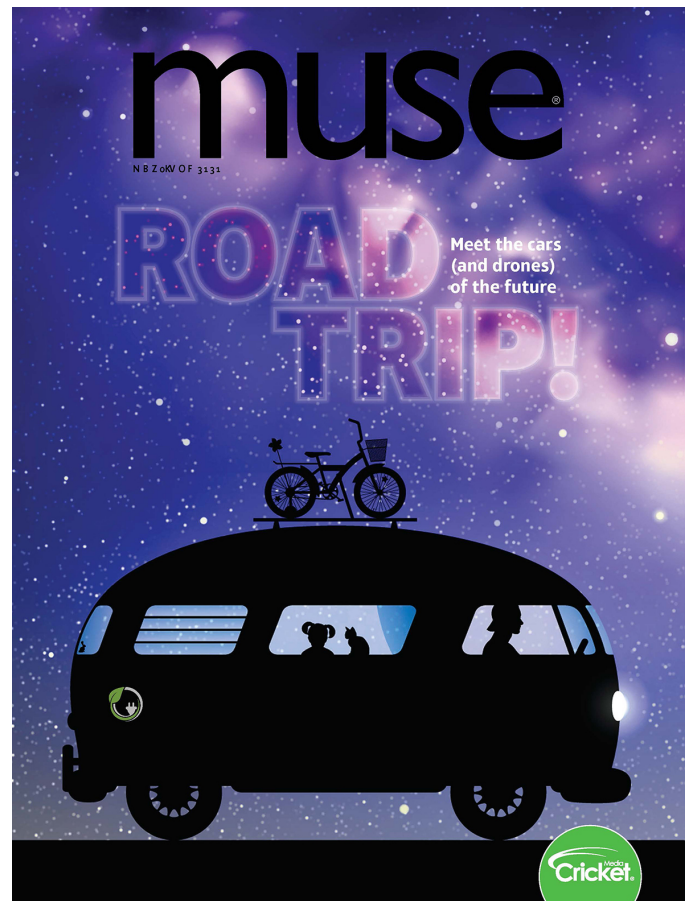
In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

• Powering the Road Ahead
Expository Nonfiction, ~1050L
• Drone Home
Expository Nonfiction, ~1150L
• Moral Machines
Expository Nonfiction, ~650L

Powering the Road Ahead

pp. 20–23, Expository Nonfiction

Buckle up and get ready to learn. Students will examine the vehicles of the future and learn how alternative energy will be required to fuel new modes of transportation.

Lexile Score: ~1050L

RESOURCES

- Fueled by the Future

OBJECTIVES

- Students will learn how cars of the future will rely on alternative energy sources.
- Students will compare and contrast the efficiency of vehicles with different sources of power.
- Students will write a persuasive essay that advocates for the use of either electric or hybrid vehicles.

KEY VOCABULARY

- **EVs (p. 22)** **E**lectric **V**ehicles; vehicles that run only on electricity
- **hybrids (p. 22)** vehicles that contain both an electric motor and a gas engine that can power the car
- **MPG (p. 22)** **M**iles **P**er **G**allon; the distance a vehicle can travel on one gallon of gasoline.

ENGAGE

Conversation Question: How is technology changing how humans and packages are traveling over distances?

Post the title of the article, "Powering the Road Ahead." Tell the students that the article states that electric vehicles can travel approximately 100 miles (or 161 km) before the battery needs to be recharged. If you need to travel 900 km, how many times would you need to charge your vehicle? Require students to use mathematical strategies to support their answers.

INTRODUCE VOCABULARY

Use key vocabulary words to review the use of acronyms (condensed versions of phrases). Ask the students why they are useful and brainstorm commonly used acronyms (Ex: ASAP, FBI, ATM). Discuss keywords before reading and highlight terms as they appear in the text.

READ & DISCUSS

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

- What is one of the biggest contributors to climate change?
- How do hybrid vehicles use both gas and electricity?
- How is hybrid technology improving?
- Name the hybrid vehicles mentioned in the article:
    Toyota: _____
    Honda: _____
- Explain how solar cars and hover cars function.

CONCEPT/SKILL FOCUS: Compare & Contrast

INSTRUCT: Elicit from the students that the main idea of the article is to explore how advancements in technology are proposing more efficient sources of energy to power vehicles. Allow students to work with a partner to complete the graphic organizer, *Fueled by the Future*, to compare gas-powered, electric, and hybrid automobiles. Encourage the pairs to share their finished work, instructing them to amend their charts if necessary.

ASSESS: Collect and review the *Fueled by the Future* organizers.

EXTEND

English Language Arts Review with students that a persuasive essay is a piece of writing in which the author uses logic and arguments to convince readers of their point of view. Have students revisit the article and guide them to acknowledge that some experts say that EVs are the future, while others believe that hybrids are the way forward. Instruct the class to write a persuasive essay that details what is the best option. They must provide evidence, state facts, and give examples. Logical reasoning should be supported by quotes from experts.

Fueled by the Future

Reread the article, "Powering the Road Ahead." Record the pros and cons of each powered vehicle.

VEHICLE	PROS	CONS
Gas-Powered Cars		
Electric Vehicles		
Hybrid Vehicles		

Drone Home

pp. 26–27, Expository Nonfiction

Keep your eyes to the sky and prepare for the deliveries of the future. Readers will learn how scientists developing crewless aerial vehicles are quickly advancing the technology that will result in the possibility of broad-range deliveries in many parts of the world.

Lexile Score: ~1150L

RESOURCES

- Drone Delivery

OBJECTIVES

- Students will learn how crewless aerial vehicles may change the way packages are delivered.
- Students will study the sequence and process of the drone delivery system.
- Students will practice mathematical conversions using both standard and metric measurements.

KEY VOCABULARY

- *descends* **(p. 27)** moves downward
- *drone* **(p. 26)** a robotic aircraft controlled by sensors, computers, and cameras
- *flight path* **(p. 27)** the planned course of an aircraft
- *tether* **(p. 27)** a rope/chain by which an object is attached to a fixed point to limit its range of motion

ENGAGE

Conversation Question: How is technology changing how humans and packages are traveling over distances?

As a pre-reading activity, begin a brainstorming web with the word DRONES in the center. Have the students assist in generating information for the web that emphasizes the prior knowledge students bring to this topic. Post the title of the article, "Drone Home," and prepare to read.

INTRODUCE VOCABULARY

Post and discuss the key terms. Be sure that students understand the definitions before reading the article. As a post-reading activity, have students use the four vocabulary words to summarize the article in paragraph form.

READ & DISCUSS

Pose the following questions to the students to facilitate a meaningful discussion following the reading of the article.

- o   What do drones run on?
- o   How does weather affect a drone's ability to fly?
- o   What is the maximum weight that a drone can carry?
- o   What happens after a drone has dropped off its package?
- o   What are the three locations that the article says drone deliveries are currently available? Plot them on a map.

CONCEPT/SKILL FOCUS: Sequence & Process

INSTRUCT: Review the article. Elicit from students that technology is advancing to the point where broad-range drone deliveries may soon be possible. Distribute the *Drone Delivery* graphic organizer and instruct students to refer back to the text and to properly sequence and explain each step in the delivery process. Have students share the work from their organizers aloud and amend their charts if necessary.

ASSESS: Circulate as students are working on the chart and discuss the information in the article. Direct students who are having difficulty explaining the process to reread the text with a partner.

EXTEND

Mathematics Review the article "Drone Home" with the students and have them highlight all of the mathematical information. Direct them to page 26, where the article states, "Most drones fly an average of 150 ft (45 m) above the ground and can hover like helicopters." Convert 150 feet into inches, and then into yards. Convert 45 meters into centimeters, then into decimeters. Further challenge students to convert other measurements from the article.

Drone Delivery

Use information from the article, "Drone Home," to put the steps of drone delivery in the correct order. Then, write a few sentences to explain what occurs during each step.

The drone picks up the package.	You want to buy your sweetheart chocolates.	The drone completes the landing process.	You place your order.	The drone knows where to deliver your package.

Steps	Explanation
STEP 1 _____	
STEP 2 _____	
STEP 3 _____	
STEP 4 _____	
STEP 5 _____	

Delivery Complete!

Moral Machines

pp. 38–41, Expository Nonfiction

Speed, swerve, or stop? Readers will scrutinize the ethical questions that the manufacturers of driverless cars must consider. Who will ultimately be responsible for programming how these cars respond to critical situations?

Lexile Score: ~650L

RESOURCES

- Motorized Morals

OBJECTIVES

- Students will learn about the numerous ethical dilemmas surrounding the self-driving car.
- Students will explore the problems and possible solutions regarding driverless cars.
- Students will create and administer an ethics-based quiz.

KEY VOCABULARY

- *ethicists* **(p. 38)** people who specialize in ethics and are devoted to ethical principles
- *pedestrian* **(p. 40)** a person traveling on foot, walking along a road
- *scenario* **(p. 38)** a sequence or development of events
- *sensors* **(p. 40)** devices that respond to physical stimulus

ENGAGE

Conversation Question: How is technology changing how humans and packages are traveling over distances?

To create high interest in this topic, present a YouTube video clip that examines the scenarios from the scientific study, "Moral Machines," which was developed by MIT professors. There are many great clips available, but preview them first to be sure the scenarios are appropriate for your class. Allow time for discussion.

INTRODUCE VOCABULARY

Invite pairs of students to find definitions for the key vocabulary terms. Then post the definitions provided so that students may check their work. Have the pairs choose six additional words from the article and procure definitions. They will then create a crossword puzzle using all ten words. Share puzzles with another class for use as a pre-reading activity for this article.

READ & DISCUSS

Post and discuss the questions before reading. Read the article aloud, pausing when answers to the questions are revealed, and encourage students to elaborate.

- o How will driverless cars make split-second decisions?
- o What were people's answers to the "13 Moral Machine" questions typically based on?
- o Who should decide how a self-driving car should behave?
- o Patrick Lin, professor at Stanford University, says driverless cars present too many "no-win" situations. Do you agree or disagree? Why?

CONCEPT/SKILL FOCUS: Problems & Solutions

INSTRUCT: Inform students that they will be rereading the article with a partner and highlighting passages that depict how experts are trying to solve the moral questions regarding driverless car technology. Distribute copies of the graphic organizer, *Motorized Morals*, and tell students that they will be responsible for recording the problem/solution relationship from the article. Pairs should discuss and amend their findings as they complete their work.

ASSESS: Review the information that the students listed on their charts. Evaluate the thoroughness and accuracy of their statements.

EXTEND

Ethics Have students brainstorm other moral dilemmas. (Ex: how to handle lunch-room dynamics, team or peer pressure situations, etc.) Instruct small groups of students to create morality quizzes following the MIT format. They should administer the quiz and then organize the results objectively. (Information, not judgment, is the goal.)

Motorized Morals

Refer to the article "Moral Machines" to record how each of the listed solutions could potentially resolve the ethical dilemma. Circle the solution that YOU believe would resolve the problem most efficiently.

Primary Problem	Proposed Solutions
Who should decide what actions self-driving cars take in critical situations?	1. Car manufacturers: 2. Car owners: 3. Government: