

Exploring Space with Astronauts

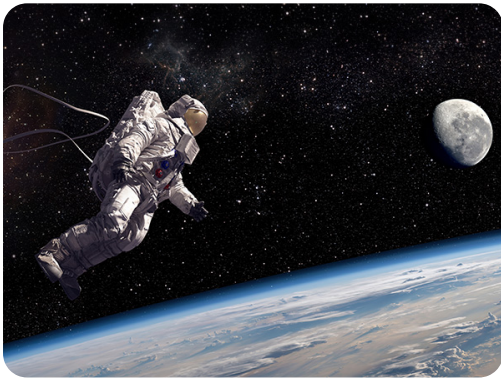
Grade: 6-8

Topic: Science

Unit: Space



Overview



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In this lesson mini, students will study space exploration by engaging with key vocabulary and learning about important space milestones and notable astronauts. Students will read relevant texts and watch video interviews that will guide discussion and support them in completing vocabulary exercises, research projects, and visual summaries.

Ideas for Implementation

- **Science**
- **Literacy**
- **Library media**
- **Intervention or enrichment**
- **Interdisciplinary collaboration**
- **Pair with *Britannica Expedition: Learn!***

Key Vocabulary & Definitions

- **Apollo 11** (proper noun): the mission in 1969 that successfully landed humans on the Moon for the first time
- **artificial satellites** (noun): human-made objects placed in orbit around Earth or other celestial bodies
- **cislunar space** (noun): the region of space between Earth and the Moon, including the Moon's orbit
- **communications satellites** (noun): satellites that enable long-distance communications around the world
- **cosmic dust** (noun): tiny particles of matter found in space
- **intergalactic space** (noun): the vast space between galaxies in the universe
- **interplanetary space** (noun): the region of space between planets within a solar system
- **interstellar space** (noun): the space between stars within a galaxy
- **meteorological satellites** (noun): satellites used for weather observation and forecasting
- **Neil Armstrong** (proper noun): the first person to set foot on the Moon during the Apollo 11 mission

- **space exploration** (noun): the act of investigating and discovering outer space
- **space technology by-products** (noun): inventions or products originally developed for space exploration that have found useful applications on Earth
- **Sputnik 1** (proper noun): the first artificial satellite to orbit Earth, launched by the Soviet Union in 1957
- **Yuri Gagarin** (proper noun): the first human to orbit Earth in space, in 1961

Authentic Learning Extensions

Authentic learning opportunities for studying space exploration involve real-world experiences and practical applications that help students understand scientific concepts meaningfully. Here are some examples:

- **Guest Speakers:** Invite notable astronauts or space scientists to give a virtual or in-person talk to the class and share their professional experiences. This interaction allows students to engage directly with space professionals and exchange meaningful thoughts and ideas, providing real-world context to their learning about astronauts and space exploration.
- **Jobs and Careers in the Space Field:** Invite students to research and possibly interview professionals from various space-related fields, such as aerospace engineers, astrophysicists, or mission control specialists. This opportunity helps students understand the diverse career paths within the space industry and how different roles contribute to space exploration, broadening their perspectives on potential future careers.
- **Mock Mission Control:** Set up a simulated mission control scenario where students take on different roles (e.g., astronaut, mission specialist, flight director) to solve a space-related problem. This hands-on experience allows students to apply

their knowledge about space and astronauts in a practical, team-based setting, mirroring real-world space mission operations.

- **Planetarium Field Trip:** Visit your local planetarium to further explore the topic of space, with a focus on the solar system and areas where astronauts have conducted or plan to conduct missions. This allows students to get an immersive experience and make connections between the vastness of space and the specific work of astronauts, enhancing their understanding of the challenges and importance of space exploration.
- **Space Literature and Media:** Invite students to explore different fiction and nonfiction texts about space exploration and astronaut experiences, as well as documentaries and movies that showcase the training and missions of astronauts. This provides students with the opportunity to connect class content to real-world experiences and deepen their understanding of the realities of space exploration and what it takes to become an astronaut.

Activity 1:

Engaging with Space Vocabulary



>40
MINUTES

By the end of the activity, students will be able to explain the history of space exploration using key vocabulary words from the text.

Materials and Resources

MATERIALS

- Whiteboard, display or chart paper
- Writing utensils

RESOURCES

- 🔗 Britannica School Space Exploration article (one printed copy per student)
<https://school.eb.com/levels/middle/article/space-exploration/277156>
- 🔗 Bubble Web graphic organizer
- 🔗 Frayer Model handout (one per student and one for teacher display)
- 🔗 Frayer Model instructional strategy
- 🔗 Space Exploration Vocabulary handout (one per student and one for teacher display)

Implementation

- ① Tell students that in today's activity they will read about and discuss the topic of space exploration and work on engaging with new vocabulary words related to this subject.
- ② Begin the activity by having students brainstorm their knowledge of space exploration.
- ③ Write the word *space* in the center of a bubble web on the whiteboard or chart paper and have students copy it down. Then facilitate a class discussion in which students share their ideas to complete the bubble web together. Guide students to reflect on how space exploration has had an impact on humanity. Provide a few prompts or questions to guide the discussion, such as these:
 - *What are some famous space missions?*
 - *How has space technology improved life on Earth?*
- ④ Provide each student with a copy of the **Space Exploration article** and **Space Exploration Vocabulary handout**. Review the vocabulary words before students start reading, and clear up any questions they might have.
- ⑤ Tell students that they will read the first three sections of the Space Exploration article independently. Tell them to highlight or circle key vocabulary words as they read to help them complete the handout later.
- ⑥ After students complete their independent work, invite them to share their thoughts on the text and discuss the definitions of the vocabulary words presented.
- ⑦ Display and model how to use a modified Frayer Model graphic organizer with the whole class using the word *astronaut*. Ask students to think about the key

characteristics, visual representations, examples, and non-examples of the word and distribute a **Frayer Model handout** to each student. Refer to the "Variations" section of the **Frayer Model instructional strategy** for additional information and procedures.

- Note that the Frayer Model handout is specific to this activity; however, depending on the teacher's preference, the activity can be altered to use the traditional Frayer Model graphic organizer that accompanies the instructional strategy.

- ⑧ Assign students to work with a partner. Ask them to complete the handout by choosing a few words from the vocabulary worksheet or text. Specify the number of words students should choose (e.g., three or four) to ensure consistent workload across pairs.
- ⑨ Ask student groups to share their work and compare and contrast ideas discovered through this vocabulary practice.
- ⑩ Instruct students to work with their partners to orally summarize the key ideas found in the "Introduction," "The Realm Beyond Earth," and "Why Explore Space?" sections of the Space Exploration article. Provide a simple structure for the summary, such as including one main idea and two supporting details for each section. Invite students to present their summaries to their classmates.
- ⑪ Conclude the activity by asking students what they learned about space exploration, and ask them to add their key takeaways to their bubble maps. Have students write one question they still have about space exploration to guide future activities, lessons or discussions.

Guiding Questions: Provide students with guiding questions to support them with the independent reading task from the Space Exploration article. Guiding questions help students home in on the main ideas from the text and increase reading comprehension and vocabulary acquisition. This strategy benefits student learning by providing scaffolding for struggling readers and helping all students focus on key concepts, enhancing their understanding of the material. Consider using the following questions:

- *What is space exploration?*
- *Who are some famous astronauts, and what did they accomplish?*
- *What types of missions have human crews performed?*
- *When do the conditions of space begin?*
- *What are the principal reasons humans explore space?*

Further Reading: Ask students to read additional sections of the Space Exploration article and choose new vocabulary words to explore using the Frayer Model. This extension activity benefits advanced learners by allowing them to delve deeper into the subject matter, enhancing their vocabulary and reading comprehension skills at a higher level.

Astronaut Research: Ask students to use reliable Internet resources to research the two astronauts mentioned in the text, Neil Armstrong and Yuri Gagarin. Invite students to research their careers and notable accomplishments. This research task benefits student learning by encouraging independent inquiry, developing students' digital literacy skills, and helping students make connections between the text and real-world examples, thus deepening their understanding of space exploration history.

Vocabulary Cloze: Instead of asking students to define key vocabulary words from the text, engage them in a vocabulary cloze exercise. This activity focuses on new vocabulary acquisition by having students fill in missing words from a sentence. This variation benefits student learning by providing a more contextualized approach to vocabulary acquisition, helping students understand how words are used in sentences rather than just memorizing definitions. It's particularly helpful for English language learners and students who struggle with traditional vocabulary exercises. Refer to the **Vocabulary Cloze instructional strategy** for additional details.

Collaborative Teaching

Team Teaching: For collaborative teaching and learning environments, this learning activity is well suited to a Team Teaching strategy. In this model, both teachers deliver instruction together, often alternating or integrating their teaching styles seamlessly, sometimes referred to as "tag team teaching." This collaborative approach provides students with multiple perspectives and teaching styles, enriching their learning experience. By modeling effective teamwork and communication, this approach demonstrates how different viewpoints can enhance understanding and create a dynamic and interactive classroom environment. Evidence indicates that team teaching can enhance student engagement and provide a richer, more diverse educational experience.

- **Activity Introduction:** Teacher A guides the discussion on space exploration and helps students complete the bubble map as a class, while Teacher B provides each student with a copy of the Space Exploration article and Space Exploration Vocabulary handout. Teacher A reviews the vocabulary words before students start reading and clears up any questions. Both teachers contribute to the

discussion, with Teacher B adding relevant points to the

bubble web that students might miss.

- **Independent Task:** Both teachers circulate the room to ensure students comprehend the text and are engaging with new vocabulary effectively as they read the article and complete the vocabulary handout independently. Teachers offer support and ensure students are on task, alternating sides of the room to provide equal attention to all students.
- **Group Work:** Teacher A models how to effectively use the Frayer Model graphic organizer to solidify new vocabulary, while Teacher B provides each student with a copy of the graphic organizer. Both teachers circulate the room and offer support to students as they work with their partners to complete the vocabulary task. Teacher B supplements Teacher A's explanation with additional examples and clarifications as needed.
- **Presentations and Discussion:** Teacher A reassembles the class and asks each group to present their Frayer Model graphic organizers, while Teacher B instructs students to work with their partners to orally summarize the key ideas found in the first three sections of the Space Exploration article. Teachers alternate in facilitating presentations and providing feedback, demonstrating collaborative assessment.
- **Reflection and Conclusion:** Both teachers conclude the activity by asking students what they learned about space exploration while asking them to record their new learning in the bubble maps. Teachers alternate in soliciting responses and adding final thoughts, synthesizing the activity's key points together.

Activity 2: Space Milestones



>40
MINUTES



By the end of this activity, students will be able to describe different space milestones and analyze their impact on humanity.

Materials and Resources

MATERIALS

- Images of astronauts and space
- Whiteboard and display
- Writing utensils

RESOURCES

-  Britannica School Space Exploration: Milestones video
<https://school.eb.com/levels/middle/assembly/view/158418>
-  Space Milestones handout (one per student and one for teacher display)

Implementation

- 1 Tell students that during today's activity they will watch a video about space exploration milestones and work in small groups to research and present about important events in the history of space exploration.
- 2 Begin the activity by showing students different images of astronauts and space using **ImageQuest**, **Britannica**

School, or another royalty-free resource. Ask them to share important events that have happened since humans first started exploring space. Create a simple timeline on the board to record their responses.

- ③ Tell students that they will watch a video about important space exploration milestones selected by Erik Gregersen, the astronomy and space exploration editor of *Encyclopædia Britannica*.
- ④ Play the **Space Exploration: Milestones video** twice, the first time for general comprehension and the second time to ask students to identify the five milestones outlined in the video:
 - 1: Launch of Sputnik 1, the first artificial satellite, in 1957
 - 2: Flight of Yuri Gagarin, the first person in space, which proved that people could survive in space and return
 - 3: Landing of Apollo 11 on the Moon
 - 4: Launch of the Hubble Space Telescope
 - 5: Flights of SpaceShipOne—the first private spacecraft
- ⑤ As students share, write the five milestones on the whiteboard in a timeline format. Add these to the timeline created in step 2.
- ⑥ Divide the class into five topic groups, and assign each group a different milestone to research in class using reliable Internet sources. Provide each student with a **Space Milestones handout** to guide their research.
- ⑦ Instruct each group to create a short oral presentation about their assigned event using a digital presentation

tool. Provide clear guidelines for the presentation, such as a time limit of three to five minutes and required elements such as key facts, images, and significance of the event. Remind students to make eye contact, project their voices, speak at an appropriate pace, and use engaging language to captivate their audience.

- ⑧ Invite the groups to present their research in chronological order, from the launch of Sputnik 1 to the flight of SpaceShipOne.
- ⑨ As students give their presentations on each event, ask audience members to take notes on the key ideas presented to use for class discussion. Allow a few minutes for questions after each presentation.
- ⑩ As a class, discuss the importance of space exploration, the contributions that different astronauts have made to scientific research, and any predictions students might have about future missions. To facilitate discussion, use guiding questions such as these:
 - *How has space exploration benefited life on Earth?*
 - *What do you think will be the next major milestone in space exploration?*
- ⑪ Conclude the activity by asking students to write something new they learned about space and what they would like to learn in the future. Consider collecting these to inform future activities or lesson planning.

Differentiation and Variations

Media Resources: Invite students to watch excerpts from documentaries and movies that showcase different space milestones for additional exposure to these events. This helps students build connections between content learned in the activity and other more mainstream media sources. Consider providing a guided viewing handout to help students focus on key points while watching. This multimodal approach supports visual and auditory learners, enhancing comprehension and retention of key concepts.

Further Research: Ask students to use reliable Internet resources to research other important space exploration milestones and astronaut missions. Provide a list of suggested topics or events for students who may need additional guidance. This differentiation allows for deeper exploration of topics that interest individual students, promoting engagement and supporting self-directed learning.

Visual Learners: Create a visual space exploration timeline using images and brief descriptions to display in the classroom. This supports visual learners and serves as a reference throughout the unit. By providing a persistent visual representation of the content, this approach reinforces learning for visual learners and helps all students understand the chronological relationships between events.

Poster Boards: Consider asking students to use poster boards, printed images, markers, and colored pencils to present their work to their peers. This gives students an opportunity to engage in hands-on teamwork to complement their online research work. Provide a rubric for poster creation to ensure key information is included. This hands-on approach caters to kinesthetic learners and encourages creativity, while also developing collaboration and presentation skills.

Digital Timeline: As a follow-up activity, have students add the events they researched to a class digital timeline or physical display in the classroom. Use a collaborative tool, approved by your school or district, to create an interactive timeline that can be

easily shared and updated. This activity reinforces chronological understanding and tech literacy, while also creating a collaborative class resource for ongoing reference and learning.

Role-Play Presentations: Encourage students to present their research in character as a key figure from their assigned space milestones. This adds an engaging, creative element to the presentations and helps students connect more deeply with historical figures. Role-playing supports empathetic understanding and helps students internalize historical perspectives, enhancing their grasp of the human elements in space exploration history.

Collaborative Teaching

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- **Activity Introduction:** Teacher A shows students different images of astronauts and space using ImageQuest, Britannica School or another royalty-free resource. Teacher B asks students to share important events that happened since humans first started exploring space. Both teachers collaborate to create a simple timeline on the board to record student responses.

- **Video Viewing:** Teacher A introduces the Space Exploration: Milestones video and provides students with a note-taking sheet. Teacher B plays the video twice, first for general comprehension and then to identify specific milestones. Both teachers lead a discussion about the key events presented in the video.
- **Research Preparation:** Teacher A explains the research task and assigns students to their groups, while Teacher B models expectations for group work and presentations. Teacher A provides each student with a copy of the Space Milestones handout, while Teacher B sets up the digital design tools for presentations.
- **Group Work:** Teachers A and B circulate around the room to support the different groups as they complete their research projects. They ensure students stay on task and provide guidance on using reliable sources and creating effective presentations.
- **Presentations and Discussion:** Teacher A reassembles the class and asks the groups to present their space exploration milestones in chronological order. Teacher B ensures that audience members stay on task, take notes, and provide constructive feedback. Both teachers facilitate a brief Q&A session after each presentation.
- **Closure** Teacher A concludes the activity by asking students to write down what they learned about space exploration milestones. Teacher B collects and organizes the responses for future activities or lesson planning.

Activity 3:

Meet an Astronaut



30-40

MINUTES

By the end of the activity, students will be able to discuss what inspired astronaut Jessica Meir to pursue a career in science and become an astronaut.

Materials and Resources


MATERIALS


- Images of astronauts and space
- Whiteboard and display
- Writing utensils

RESOURCES

 Britannica School Jessica Meir biography article
<https://school.eb.com/levels/middle/article/Jessica-Meir/644125>

 Britannica School Jessica Meir video
<https://school.eb.com/levels/middle/assembly/view/272424#>

 Jessica Meir Discussion Questions handout (one per student and one for teacher display)

 Storyboard graphic organizer (one per student and one for teacher display)

Implementation

- ① Tell students that today they will watch a video interview about a notable astronaut and complete a video discussion guide, storyboard, and reflection exercise.
- ② Begin the activity by asking students to share what they know about astronauts and what they think people need to do to become trained in this field.
- ③ Tell students that they will watch a video about astronaut Jessica Meir talking about her love of science and why she chose to become an astronaut. Provide some brief background information on Jessica Meir to contextualize the video. Share that Meir is an American astronaut who was recently chosen to be one of the 18 astronauts in the Artemis program, the first U.S. space mission to send astronauts to the moon since 1972. Consider reading the **Jessica Meir biography** for more background information before watching the video.
- ④ Display the **Jessica Meir video** and provide each student with a **Jessica Meir Discussion Questions handout** to complete as they watch the video. Consider playing this video twice to ensure students retain the main points. Encourage students to take notes during the video.
- ⑤ After watching the video, invite students to turn and talk to a partner about the guiding questions.
- ⑥ Invite student volunteers to share something interesting they learned about Jessica Meir's journey to becoming an astronaut.
- ⑦ Provide each student with a copy of the **Storyboard graphic organizer** to complete the story of Meir's life by writing and/or drawing the key events that shaped her. Specify how many events students should include in their storyboards (e.g., at least six key events).

- Example: her experience in first grade, her experience growing up in a small town, her interest in plants and animals, her curiosity about the night sky, and her desire to pursue her passion and become an astronaut

⑧ Invite student volunteers to share their work with their classmates.

⑨ Highlight that at the end of the video Jessica Meir offers two important pieces of advice. Display these passages and have students analyze and discuss Jessica Meir's thoughts as a class:

- "Maintain that scientific curiosity and never stop asking questions because that really is the root and the foundation of what propels us forward for all types of exploration, whether here on our planet or off the planet as well."
- "Make sure that what you're doing is the one thing that you're passionate about. Not what your mom or your dad think you should be doing, or what society kind of is trying to ingrain in some idea that you think is the right thing to do. And more importantly, just to be happy in the end and be content doing it."

⑩ Following the class discussion, invite students to write a one-paragraph reflection on one of these two pieces of advice. Consider providing clear writing prompts and specify the expected length (e.g., five to seven sentences).

- Jessica Meir finds scientific curiosity valuable because ____.
- Jessica Meir believes that it's important to pursue something you feel passionate about because ____.

- ⑪ Conclude the activity by asking students to share one new piece of information they learned or found interesting about Jessica Meir.

Differentiation and Variations

Video Transcript: Provide students with a video transcript to refer to as they complete the guiding questions and storyboard. Having a text reference supports students in completing these independent tasks. This benefits student learning by accommodating different learning styles and allowing students to review information at their own pace, enhancing comprehension and retention.

Astronaut Videos: Invite students to watch additional video interviews of different astronauts to explore this topic further. This allows students to widen their knowledge of the field. This strategy benefits student learning by providing diverse perspectives and experiences within the field of space exploration, fostering a broader understanding and potentially inspiring students with different role models.

Interview Questions: Conclude the activity by asking students to work in small groups to come up with additional interview questions for Jessica Meir. This allows students to work collaboratively to reflect on what they already know and what they would like to learn. This variation benefits student learning by encouraging critical thinking, promoting curiosity, and reinforcing key concepts through peer interaction and discussion.

Collaborative Teaching

Team Teaching: For collaborative teaching and learning environments, this learning activity is well suited to a Team

Teaching strategy. In this model, both teachers deliver instruction together, often alternating or integrating their teaching styles seamlessly, sometimes referred to as “tag team teaching.” This collaborative approach provides students with multiple perspectives and teaching styles, enriching their learning experience. By modeling effective teamwork and communication, this approach demonstrates how different viewpoints can enhance understanding and create a dynamic and interactive classroom environment. Evidence indicates that team teaching can enhance student engagement and provide a richer, more diverse educational experience.

- **Activity Introduction:** Teacher A introduces the activity topic and objectives, while Teacher B distributes the Jessica Meir Discussion Questions handout and explains its purpose.
- **Video Viewing:** Teacher A shows the Jessica Meir video and leads a discussion about the key events presented in the interviews. If playing the video twice, teachers can switch roles for the second viewing.
- **Class Discussion:** Teacher A leads the whole-class discussion about what students learned from the video, while Teacher B records key points on the board.
- **Storyboard Activity:** Teacher A explains the Storyboard handout, while Teacher B distributes the materials. Both teachers circulate to support students as they complete the story of Meir’s life.
- **Advice Analysis:** Teacher A displays and reads aloud Meir’s advice, while Teacher B facilitates the class discussion using prepared guiding questions.
- **Reflection Writing:** Teacher A explains the reflection-writing task, while Teacher B provides support to students who need additional guidance.