Fourth Grade

DISCOVER AMERICA

Course 22 - Teacher Guide

Skyward Pioneers: The Wright Brothers

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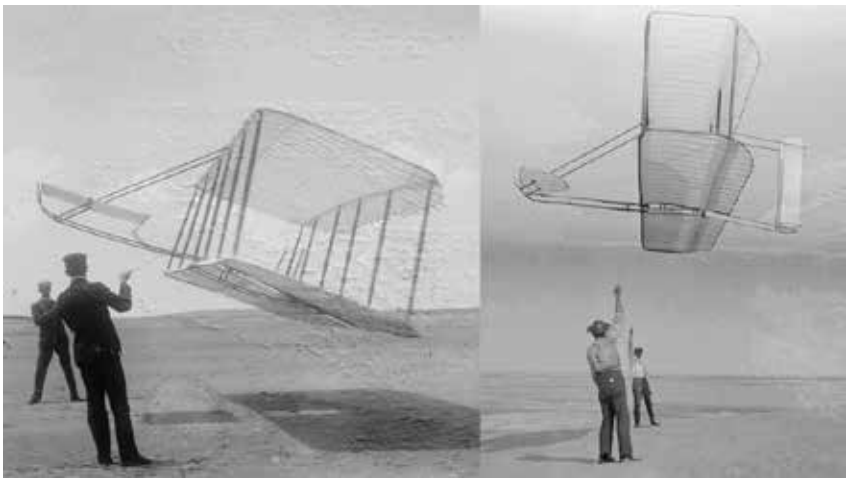

Key Themes

- Imagination
- Freedom to Explore
- Flight
- Perseverance
- Teamwork

Core Values

- Community
- Life
- Liberty

Learning Objectives

Students will be able to

- List two obstacles the Wright brothers faced.
- Define aviation.
- Compare and contrast the Wright glider with modern-day aircraft.
- Describe the relationship between Wilbur and Orville Wright.
- Compare and contrast Wilbur and Orville Wright.

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Key Terms

01	**aviation:** the making and flying of aircraft that are heavier than air.
02	**coaster brakes:** also known as pedal or foot brakes, devices that allow riders to stop their bikes by pedaling backward.
03	**divinity:** the study of religion.
04	**engine-powered airplane:** aircraft with a motor that provides thrust, allowing it to move forward and stay in flight.
05	**fascinated:** extremely interested.
06	**glider:** an aircraft that soars through the air without the help of a motor.
07	**mischievous:** behavior that is slightly bad but is not intended to harm anyone.
08	**perseverance:** the ability to keep doing something in spite of obstacles.
09	**pursue:** to search for something.
10	**wing warping:** the twisting, or warping, of plane wings to control the roll of the plane.

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Introduction

TELL Students

Here's a riddle for you: *With engines that roar and propellers that spin, I race through the air, a marvel within. From passenger flights to military might, I serve diverse purposes day and night. What am I? This wonderful sight. Mastering the skies, with all my might?* Yes, the answer is an airplane or a type of aircraft.

ASK Students

Have you ever been on an airplane? What was your experience? What do you know about airplanes and how they fly?

TELL Students

Today, we are going to learn about engine-powered airplanes. We are also going to learn about two remarkable brothers, Wilbur and Orville Wright. These brothers were pioneers in aviation, which means they were among the first people to successfully build and fly airplanes. Aviation refers to the making and flying of aircraft that are heavier than air. The Wright brothers were born to Milton and Susan Wright, who taught them strong values and a love for learning. Wilbur and Orville's curiosity and determination led them to achieve something incredible: inventing the first successful piloted engine-powered airplane. Let's watch another episode of Star Spangled Adventures to learn more about the Wright brothers!

WATCH

Star Spangled Adventures Cartoon Ep. 22: The Wright Brothers

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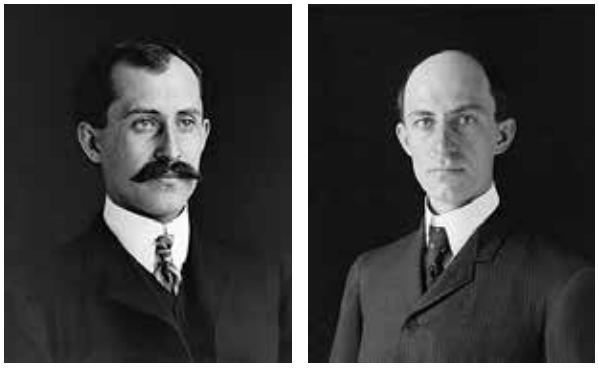
Lesson

TELL Students

Wilbur was the older Wright brother. He was known as someone who stayed calm. Even as a young boy, Wilbur showed intelligence, confidence, and a knack for speaking and writing. He really enjoyed math and science. When Wilbur was about to finish high school, his family moved, but he still planned to attend Yale University's divinity school. **Divinity means the study of religion.** Unfortunately, Wilbur wasn't able to finish high school because of some unexpected events. Instead, he took college preparatory courses to pursue his dream of teaching. Pursue means to search for something.

At the age of 18, Wilbur faced a setback when he lost his teeth in an accident playing a game of ice hockey called "shinny." This event made him feel less confident and caused other health issues. He eventually abandoned his school goals. But, Wilbur continued to learn. He spent much of his time in his father's library, reading and practicing his writing skills. He also cared for his mother, who was ill and unfortunately passed away.



Orville (left) and Wilbur Wright in 1905

ASK Students

What obstacles did Wilbur overcome?

TELL Students

Please carefully read the passage below to learn about Wilbur's brother, Orville. Think about the similarities and differences between the brothers as you read.

Orville, similar to his brother Wilbur, excelled in math and science. But he also had a mischievous side. ***Mischievous describes behavior that is slightly bad but is not intended to harm anyone.*** *Despite his mischievous side, Orville showed strong leadership qualities, enthusiasm, and energy, and had a knack for being inventive and curious. Orville gained local*

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recognition for his skill in designing, building, and selling kites. He was also known for dismantling items to understand how they work. He left school in the 11th grade because he did not feel challenged. He went on to take college preparatory courses. Like Wilbur, he continued to learn outside of the traditional school setting. As a teenager, Orville started a

printing business with his friend, Ed Sines. Wilbur later joined Orville in the printing business. Together they not only operated but also wrote and published two local newspapers.

ASK Students
How are Wilbur and Orville alike? How are they different?

TELL Students
The Wright brothers moved from the printing business to a bicycle rental and repair shop. Over time, the business grew to include bike sales. Then, they introduced their own brand of bicycles. They used innovative features like coaster brakes, which allow riders to slow down by pedaling backward. Even though their bicycle business was successful, Wilbur and Orville were drawn to their lifelong passion for flight.


Wright brothers bicycle

ASK Students
What do you know about the relationship between Wilbur and Orville?

TELL Students
Their fascination with flying began in childhood when their father gave them a toy helicopter. **Fascinated means extremely interested.** But it wasn't until later that the Wright brothers decided to seriously pursue their dream of flight. Wilbur and Orville had become skilled in mechanics from working on printing presses and bicycles. They also saved up enough money to start this new adventure in flight. In

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1899, Wilbur wrote to the Smithsonian Institution in Washington, D.C., asking for information on flying experiments. Orville joined in, and together they began to study everything they could find about flight.

ASK Students
What experiences prepared the Wright brothers for their new adventure in flight?

TELL Students
The Wright brothers didn't start out trying to invent the airplane. They were curious about flying and wanted to learn more about it. They looked at what other people had tried before, what questions still needed answers, and how they could make improvements. After studying everything they could find about flight, they were surprised to see that not much progress had been made, even though people had been interested in flying for a long time.

ASK Students
What did the Wright brothers find out after doing research on flight?

TELL Students
The Wright brothers didn't just work on their flying machine for a short time. They spent many years on it! They figured out that there were three big problems they needed to solve to make their airplane work: how to balance and control it, how to design the wings to lift it up, and how to make it go forward. While some people focused on just one problem, the Wright brothers worked on all three at the same time.

ASK Students
What are the three big problems that the Wright brothers needed to solve to make the airplane work? How did they approach the problems?

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TELL Students

The Wright brothers believed that the biggest challenge was making sure the pilot could control the airplane. They thought of it like riding a bike, where the rider keeps the bike balanced and on course. But they had to figure out how to do that in the air!

ASK Students

Think about riding your bicycle without training wheels. Does it require a lot of balance?

TELL Students

The Wright brothers worked together to solve the three big flight problems. Please read the passage below to learn about their determination and what they learned as they experimented. *The Wright brothers tried a lot of experiments and tested different kites and gliders. They did most of their work in their bicycle shop in Dayton, Ohio. Then, they went to Kitty Hawk, North Carolina, because it had perfect conditions for testing their inventions.*

The brothers discovered many important things during their experiments. They came up with an idea called "wing warping." ***Wing warping is the twisting, or warping, of plane wings to control the roll of the plane.*** *It helped balance the airplane during flight and controlled how it moved sideways. The Wright brothers tested their ideas with gliders in 1900 and 1901, but the results weren't what they expected.* ***A glider is an aircraft that soars through the air without the help of a motor.*** *The Wright brothers built a wind tunnel and did over two hundred tests with different wings and shapes. They learned important things about how wings should be shaped and how air moves over them.*

ASK Students

What is "wing warping?" What role did a wind tunnel play in the Wright brother experiments?

Kitty Hawk

The Wright Brothers - Fourth Grade

Lesson

TELL Students

The Wright brothers began by experimenting with gliders and eventually found success. Then, they focused on adding power to their aircraft. With the help of their mechanic, Charlie Taylor, they designed a gasoline engine and connected it to propellers made from airplane wings. The Wright brothers achieved the first successful piloted engine-powered airplane on December 17, 1903 in Kitty Hawk. On this historic day, Orville took the first flight, covering120 feet in 12 seconds. This marked the first powered flight in history. The brothers made three more flights that day, with Wilbur's final flight covering 852 feet in 59 seconds. Although the aircraft was damaged after the last flight, their achievement paved the way for modern aviation.

ASK Students

What did the Wright brothers focus on after they found success with gliders? What is the difference between a glider and an engine-powered airplane?

Glider airplane

TELL Students

The Wright brothers made history with their continuous improvements in aircraft design. Just two years after their first flight, they achieved another milestone when their airplane flew for 39 minutes, covering a distance of 24.5 miles. Their determination and innovative spirit paved the way for modern flight. They inspired future generations, including Neil Armstrong, who carried a piece of the Wright Flyer to the moon. Their legacy reminds us to persevere and dream big, because anything is possible with determination and hard work. Perseverance is the ability to keep doing something in spite of obstacles.

ASK Students

What inspired the Wright brothers? Who did the Wright brothers inspire? How did their determination and innovation change the world?

The Wright Brothers - Fourth Grade

From Wright to Flight: Comparing the Wright Brothers' Plane to Modern Aircraft

Objective: To engage fourth grade students in a comparative analysis between the Wright brothers' historic plane and modern aircraft. This activity fosters critical thinking skills and an understanding of aviation advancements over time.

Materials Needed:

1. Pictures or diagrams of the Wright brothers' plane (Wright Flyer) and various modern aircraft.
2. Poster board or sheet of large paper for group presentations.
3. Markers, colored pencils, or crayons.
4. Index cards or sticky notes.
5. Access to the internet or reference books for research.

Introduction:

- Begin by reviewing the Wright brothers and their historic flight in 1903. Show pictures or diagrams of the Wright Flyer and briefly explain its design and significance in aviation history.
- Discuss the basic principles of flight, including lift, thrust, drag, and weight, to provide context for the comparison activity. Please see the details below.

Explain to Students:

Flight, whether it's achieved by birds, insects, or aircraft, is governed by four fundamental principles: lift, thrust, drag, and weight. Understanding these principles helps explain how objects, including airplanes, can fly through the air.

- Lift is the force that acts perpendicular to the direction of motion and keeps an aircraft airborne. It is generated primarily by the wings of an airplane. As the airplane moves forward, the shape of the wings and the angle at which they meet the air (known as the angle of attack) create a pressure difference between the upper and lower surfaces of the wing. This pressure difference results in an upward force, known as lift, which counters the force of gravity pulling the aircraft downward.

- Thrust is the force that propels an aircraft forward through the air. It is generated by engines or propulsion systems, such as jet engines or propellers. The amount of thrust produced must be greater than the total drag acting on the aircraft to overcome resistance and maintain forward motion.

- Drag is the aerodynamic force that opposes an aircraft's motion through the air. It is caused by friction between the aircraft's surface and the air, as well as the disruption of airflow around the aircraft. There are two main types of drag: parasitic drag, caused by the aircraft's shape and surface features, and induced drag, generated by the production of lift. Minimizing drag is essential for efficient flight and requires careful design considerations.

- Weight is the force exerted by gravity on an object. In the context of flight, weight is the force that pulls an aircraft toward the Earth's surface. It is counteracted by the lift generated by the wings. To achieve flight, the lift produced by the wings must be equal to or greater than the weight of the aircraft.

The successful flight of an aircraft depends on achieving a delicate balance between lift, thrust, drag, and weight. Pilots and engineers must carefully manage these forces to ensure safe and efficient flight operations.

Group Formation:
- Divide the class into small groups of 3-4 students each. Ensure that each group has access to the materials needed for the activity.

Research:
- Assign each group a specific modern aircraft to research (e.g., commercial airliner, military jet, helicopter, drone).
- Provide access to reference materials and school-approved internet sites for students to gather information about their assigned aircraft, focusing on its design, capabilities, and uses.

Comparison Chart:
- Have each group create a comparison chart on their poster board, comparing and contrasting the Wright Flyer with their assigned modern aircraft.
- Encourage students to consider factors such as size, materials, propulsion, speed, range, passenger capacity, and technological advancements.

Group Discussion:
- Facilitate a group discussion where each group presents their comparison chart to the class.

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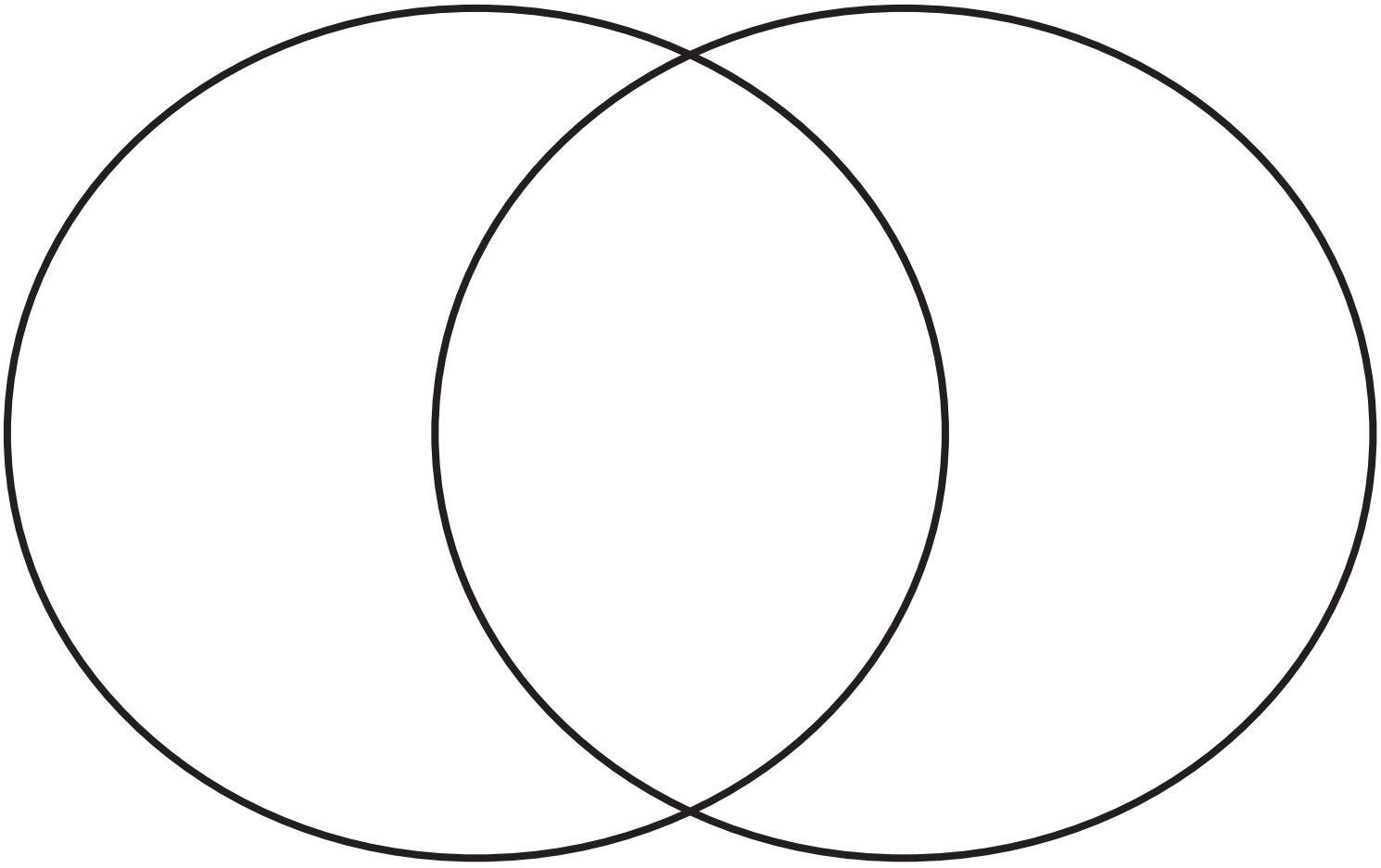
Venn Diagram



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Comparing and Contrasting

Instructions: Read the information about Wilbur and Orville Wright. Then, complete the Venn diagram by writing similarities in the overlapping section and the differences in the outer sections.

Wilbur Wright

- older brother
- calm and collected
- intelligent, confident, and skilled in speaking and writing
- enjoyed math and science
- planned to attend Yale University
- faced obstacles such as losing his teeth in an ice hockey accident and his mother's illness
- spent time in his father's library reading and practicing writing

Orville Wright

- younger brother
- enthusiastic and energetic
- inventive and curious
- skilled in designing, building, and selling kites
- dropped out of 11th grade as he wasn't challenged
- started a printing business with a friend
- worked with Wilbur in the printing business and published newspapers

Conclusion Questions:

What are some key similarities between Wilbur and Orville Wright?

What are some key differences between Wilbur and Orville Wright?

How do you think their similarities and differences influenced their work together on inventing the airplane?

- Encourage students to explain their findings and highlight similarities and differences between the Wright Flyer and modern aircraft.
Allow time for questions and clarifications from other groups.

Reflection:
- Conclude the activity with a brief reflection session where students share their thoughts on how aviation has evolved since the time of the Wright brothers.
- Prompt students to consider the impact of technological advancements on air travel, as well as the continued importance of innovation in aerospace engineering.

The Wright Brothers - Third Grade

Resource List

https://kids.nationalgeographic.com/history/article/wright-brothers

https://www.nps.gov/articles/wright-brothers.htm

https://www.nps.gov/people/wilburwright.htm

https://www.nps.gov/people/orvillewright.htm

https://airandspace.si.edu/stories/editorial/who-were-wright-brothers

https://www.smithsonianmag.com/smithsonian-institution/how-the-wright-brothers-took-flight-180981001/

https://memory.loc.gov/diglib/legacies/loc.afc.afc-legacies.200002919/

https://airandspace.si.edu/stories/editorial/wright-before-aviators

https://airandspace.si.edu/explore/stories/researching-wright-way#aerodynamics

https://www.wright-brothers.org/History_Wing/Wright_Story/Inventing_the_Airplane/Kitty_Hawk/Afflicted.htm

https://wright.grc.nasa.gov/overview.htm

https://airandspace.si.edu/collection-objects/1903-wright-flyer/nasm_A19610048000

https://www.nps.gov/articles/roadtofirstflight.htm

https://www.nps.gov/articles/firstflight.htm?utm_source=article&utm_medium=website&utm_campaign=experience_more&utm_content=small

https://airandspace.si.edu/explore/stories/researching-wright-way#aerodynamics

https://time.com/5418950/first-man-neil-armstrong-wright-flyer/

Notes