Fifth Grade

DISCOVER AMERICA

Course 22 - Teacher Guide

Skyward Pioneers: The Wright Brothers

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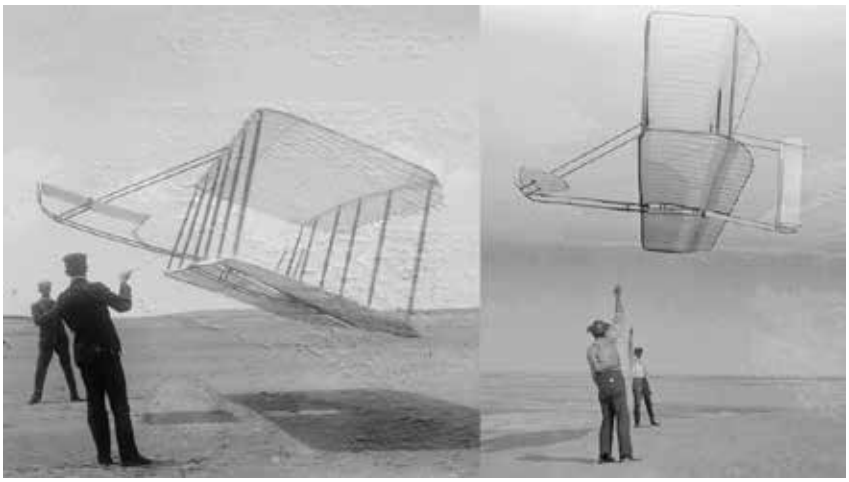

Key Themes

- 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.
- Analyze the impact of aviation advancements on society.

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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	**glider:** an aircraft that soars through the air without the help of a motor.
06	**mischievous:** behavior that is slightly bad but is not intended to harm anyone.
07	**perseverance:** the ability to keep doing something in spite of obstacles.
08	**pursue:** to search for something.
09	**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

Here is another riddle for you: *Brothers they were, with dreams so high, innovation in their hearts, reaching for the sky. One calm and collected, the other full of zest, together they soared, putting their dreams to the test. Who were these brothers, so daring and bright, whose legacy soars, like a bird in flight?* Today, we are going to learn about these two remarkable brothers, Wilbur and Orville Wright. They 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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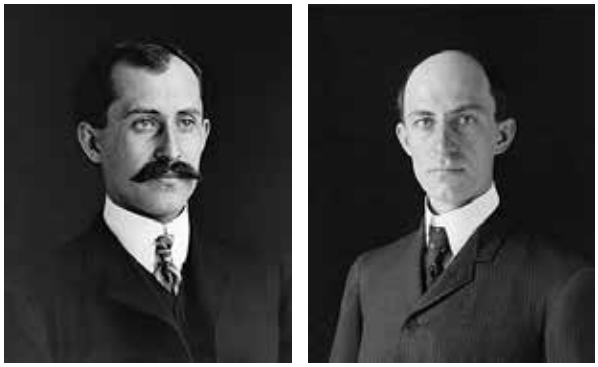
Lesson

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.** Please read the passage below to learn more about obstacles that Wilbur faced.

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 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 is "shinny?" 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,*

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enthusiasm, and energy, and had a knack for being inventive and curious. Orville gained local 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 do Wilbur and Orville compare and contrast in their pursuits and characteristics?

TELL Students
Wilbur and Orville Wright share similarities in their dedication to flight experimentation and their innovative thinking. They eventually moved from the printing business to a bicycle rental and repair shop. Over time, the business expanded 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

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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 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 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?

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
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

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TELL Students

Glider airplane

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, covering 120 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 is the difference between a glider and an engine-powered airplane? What do you know about modern aviation?

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 were some obstacles that Wilbur and Orville Wright encountered on their journey to achieve powered flight? How did Wilbur and Orville Wright demonstrate their determination and perseverance in the face of challenges?

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Wing Warping Workshop

Objective: To engage fifth grade students in a hands-on activity to learn about the concept of wing warping used by the Wright brothers in their aircraft design.

Materials Needed:

1. Cardboard sheets or foam board (cut into rectangular shapes)
2. String or yarn
3. Straws
4. Tape
5. Scissors
6. Markers or colored pencils
7. Reference materials or videos about the Wright brothers and wing warping

Introduction:

- Begin by reviewing the Wright brothers and their contributions to aviation history, focusing specifically on their innovative use of wing warping to control the flight of their aircraft.
- Show pictures or diagrams of the Wright Flyer and explain how wing warping allowed the pilots to adjust the shape of the wings for stability and control.

Discussion

- Facilitate a brief discussion about the concept of wing warping, emphasizing its role in controlling the lateral movement of the aircraft (roll).
- Explain that wing warping involves twisting or warping the shape of the wings to change the amount of lift generated by each wing, thereby controlling the aircraft's direction.
- 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.

Activity Setup:

- Divide the class into small groups of 3-4 students each.
- Provide each group with a cardboard sheet or foam board, straws, tape, string or yarn, and markers.

Building the Model:

- Instruct students to cut two slits on each side of the cardboard sheet near the top edge, approximately 1 inch apart.
- Demonstrate how to insert a straw into each pair of slits to create a wing structure.
- Have students use tape to secure the straws in place and ensure they are parallel to each other.
- Next, guide students in tying a piece of string or yarn between the two wings, passing it through the straws.
- Explain that by pulling or releasing the string, students can simulate the wing warping effect.

Experimentation:

- Encourage students to experiment with their wing warping models by adjusting the tension of the string.
- Have students observe how changing the angle of the wings affects the stability and direction of their makeshift aircraft.
- Prompt students to record their observations and discuss the similarities between their models and the Wright brothers' aircraft.

Discussion and Reflection:

- Reconvene as a class to discuss the results of the experimentation.
- Encourage students to share their observations and insights about how wing warping works and its significance in aviation history.
- Facilitate a reflection on the challenges faced by the Wright brothers in developing and refining their wing warping technique.

Extension Activity (Optional):

- Challenge students to redesign their wing warping models to improve stability or maneuverability.
- Alternatively, students can research other methods of aircraft control used in modern aviation and compare them to wing warping.

Wright Brothers Worksheet

Instructions: Please carefully read the following sentences. Fill in the blank with the correct answer.

1. Wilbur was the older Wright brother. He was known as someone who stayed _____.

2. Wilbur showed intelligence, confidence, and a knack for speaking and writing, even as a young _____.

3. Wilbur enjoyed studying _____and science.

4. Wilbur's family moved when he was about to finish _____ school.

5. At 18, Wilbur lost his teeth in an accident while playing a game of ice hockey called _____.

6. This event caused Wilbur to feel less _____.

7. Despite setbacks, Wilbur continued to _____ and practice his writing skills.

8. Orville was similar to Wilbur in that he excelled in math and _____.

9. Orville had a mischievous side but also showed strong leadership qualities and was _____.

10. Orville gained local recognition for his skill in designing, building, and selling _____.

11. Orville started a printing business with his friend, _____ Sines.

12. The Wright brothers transitioned from the printing business to a bicycle rental and repair _____.

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Answer Sheet

1. calm
2. boy
3. math
4. high
5. shinny
6. confident
7. learn
8. science
9. enthusiastic
10. kites
11. Ed
12. shop

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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