The "Wright" Attitude

Session Time: One, 50-minute session

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

Appreciate the rich, global history of aviation/aerospace and the historical factors that necessitated rapid industry development and expansion. (EU1)

Understand the importance of professionalism, ethics, and dedication as they relate to all aviation/aerospace operations. (EU4)

ESSENTIAL QUESTIONS

1. Should the Wright brothers be viewed as leaders or contributors in aviation?

LEARNING GOALS

Students Will Know

- How society responded the idea of powered, controlled flight in the early 1900s
- The effects controlled, powered flight has had on society over the past century

Students Will Be Able To

- *Describe and explain* the engineering practices the Wright brothers used to solve the power, control, and lift problems they encountered. (DOK-L2)
- *Analyze* the historical significance of the Wright brothers and others who made contributions to early powered flight. (DOK-L4)

ASSESSMENT EVIDENCE

Warm-up
Students respond to an open-ended question about how the news of the Wright brothers' success might have changed the public's view of flying.

Formative Assessment
Students compare and contrast society's response to powered, controlled flight in the early 1900's to society's response to the introduction of drones today.

Summative Assessment
Students summarize and explain the engineering practices and historical significance of the Wright brothers contributions to powered flight.

LESSON PREPARATION

MATERIALS/RESOURCES

- The “Wright” Attitude Presentation
- The “Wright” Attitude Student Activity

LESSON SUMMARY

In this lesson, students will learn how people responded to the Wright brothers’ first flight and examine how society came into the aerial age. In a warm-up exercise, students will surmise how society reacted to the news of the first flight. A class discussion and reading exercise will describe the response in more detail.

In the formative assessment, students will compare and contrast society’s response to powered, controlled flight in the early 1900’s to society’s response to the introduction of drones today. Students will then explore the Wright brothers’ rational approach engineering design.

In a summative assessment, students will analyze the impact the Wright brothers’ have had on society, both then and now.

BACKGROUND

The airplane changed the way people live. What the Wright brothers did was significant and revolutionary.

In the years after the first flight, the Wright brothers made exhibition flights for thousands of people. Viewers of these flights had a wide range of reactions to the new technology. Some were dubious about the practicality of it all. Some regarded it as nothing short of miraculous.

Today, flying has become an everyday experience—we can’t imagine a world without it. Its impact is beyond measure. The Wright brothers not only solved three very difficult flight challenges, they also helped create an entirely new world. Today, more than three billion people fly on airplanes worldwide each year.

The Wright brothers are no doubt regarded as some of the most impactful individuals in early aviation, largely in part due to the systematic and methodical approach that was taken to develop their aircraft. From the early stages, the Wrights approached problems one at a time, controlling all other variables. The first two attempts at flying gliders were not as successful as planned. After these attempts, the brothers designed their wind tunnel to perfect wing designs to maximize lift. This methodical approach resulted in the Wrights developing the first powered, controlled, and sustainable heavier-than-air flying machine.

While the Wrights’ approach allowed them to create an amazing flying machine, they were not alone in development of flying machines. Competition was something the Wright brothers recognized, and sought to capitalize on by means of patents and licensing. What they did not realize at the time was the impact this would have on the development of powered aircraft in the United States for the following years. The patent the Wrights were awarded was for the technology used to control aircraft. This was the key.

The patent wording was broad enough to allow the Wrights to file infringement suits against other aviators such as Glenn Curtis, who did not want to pay royalties when using designs newer than wing warping, such as the aileron. This competition and cornering of the industry, while profitable for the Wrights, was also very time consuming and delayed the brothers from making further advancements. The pressure they put on industry competition also stifled rapid advancement in the United States such that by the time World War I started, the United States was well behind Europe in development. Despite the pressures from the Wrights, many pioneers continued to work and advance the technology of the day resulting in faster, more stable, and more controllable aircraft.

DIFFERENTIATION

To support verbal reasoning in the class discussion during the **EXPLORE** section of the lesson, organize the class into groups for Think-Pair-Share before engaging in whole group discussion. This allows learners to think about the question, and discuss their thoughts with a partner before sharing with the larger group. Sharing encourages all students to participate and practice skills, including metacognition.

LEARNING PLAN

ENGAGE

Teacher Material: The "Wright" Attitude Presentation

Slides 1-3: Introduce the lesson.

Slide 4: In the years after the first flight, the Wright brothers made exhibition flights for thousands of people. Viewers of these flights had a wide range of reactions to the new technology. Some were dubious about the practicality of it all. Some regarded it as nothing short of miraculous.

Slide 5: Conduct the **Warm-Up.**

Allow up to 5 minutes for the **Warm-Up**. Allow for a brief discussion before collecting student work. Grade up to 5 points based on completeness and participation. [DOK 2; predict, summarize]

Warm-Up

Ask the class to individually write their response to the following question.

How do you think people felt about flying after news of the Wright brothers' successful flight spread throughout the world?

Possible responses:

People didn't believe it was real, they were frightened of flying, they thought it looked fun, or they didn't think it was for the average person.

Slide 6: In the years after the first flight, the Wright brothers made exhibition flights for thousands of people. Viewers of these flights had a wide range of reactions to the new technology. Some were dubious about the practicality of it all. Some regarded it as nothing short of miraculous.

As time permits, ask students to skim excerpts from articles and stories about the first flight in 1905. When they have finished reading, refer back to the warm-up question and ask students if they would answer differently now that they have read some commentary from the day.
http://www.pbs.org/wgbh/nova/wright/reporter.html

EXPLORE

Teacher Material: The "Wright" Attitude Presentation
Student Material: The "Wright" Attitude Student Activity

Slide 7: The airplane became a technical marvel in the early 1900s, very much like computers are today. Have students conduct their own research and pull from their own experiences to complete **The "Wright" Attitude Student Activity.**

In the **Formative Assessment,** students will compare and contrast society's response to powered, controlled flight in the early 1900's to society's response to the introduction of drones today. Allow up to 10 minutes for students to complete this part. The formative assessment is worth 15 points. Allow for a brief discussion and then collect student work. Grade up to 10 points for the first part based on completeness, and up to five points for the second part based on completeness and participation. [DOK 3; draw conclusions]

Formative Assessment

Have students work individually to complete the first part in **The Wright Attitude Student Activity.** Then have students work in groups of two or three to complete the second part.

EXPLAIN

Teacher Material: The "Wright" Attitude Presentation

Slides 8-10: The Wright brothers had a significant impact on early aviation, largely due to the systematic and methodical approach taken to develop their aircraft. They decided that controlling the aircraft would be the most crucial and hardest problem to solve.

- Performed a literature search to see what other people of their time had accomplished by writing to the Smithsonian for technical papers on aerodynamics
- Read about the works of Cayley, and Langley, and the hang-gliding flights of Otto Lilienthal
- Studied the problems other of flyers and looked for solutions by observing large gliding birds
- Approached problems one at a time, controlling all other variables
- Built a wind tunnel and gathered data on over two hundred different wings and airfoil models tested
- Developed model-testing techniques to more accurately determine the lift and drag of their aircraft

This scientific, methodical approach resulted in the Wrights developing the first powered, controlled, and sustainable heavier than air flying machine. While the Wrights' approach allowed them to create an amazing flying machine, they were not alone in the development of flying machines.

Questions

Ask students to identify which engineering practices the Wright Brothers used in designing the first powered, controllable flying machine. They should justify their answer with evidence.

Possible responses:

Asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing data, using mathematics, etc.

EXTEND

Teacher Material: [The "Wright" Attitude Presentation]

Slide 11: The Wright brothers solved the problem that no one else could: aircraft control. Show students a video that discuss how the Wright's solved for this incredible challenge.

- "How We Invented The World: Wright Brothers" (Length - 3:19)

  http://video.link/w/eNLd

Questions

After the video concludes, ask students why they think the Wright brothers are often called the "Fathers of Modern Aviation." Underscore the word "modern."

EVALUATE

Slide 12: Conduct the Summative Assessment.

Use the scoring rubric for grading. Allow students to use their notes.
[DOK 2; summarize, infer]

Summative Assessment

Ten minutes before the end of class, show students the following questions on slide 12 and ask them to respond in one to two paragraphs for each.

1. Which engineering practices were used by the Wright brothers during development of their flying machines? Describe how they used them.

2. In what ways did the Wright brothers' rational approach to engineering impact society then and now?

Summative Assessment Scoring Rubric

- Follows assignment instructions
- Writing shows evidence of one or more of the following:
- Knowledge of the engineering practices used by the Wright brothers
- Ability to describe the implications of the Wright brothers work and its impact on society
- Writing shows an understanding of course of the concepts covered in the lesson
- Writing shows an in-depth thinking including analysis or synthesis of lesson objectives

Points	Performance Levels
9-10	Consistently demonstrates criteria
7-8	Usually demonstrates criteria

5-6	Sometimes demonstrates criteria
0-4	Rarely to never demonstrates criteria

Collect student work at the end of class.

GOING FURTHER

Watch the National Geographic movie "Living in the Age of Airplanes," which explores the ways in which the world has changed since airplanes were invented. https://www.nationalgeographic.org/education/living-age-airplanes/

To read more on the the Wright brothers' business:

http://www.wright-brothers.org/History_Wing/Wright_Story/Airplane_Business/Airplane_Business_Intro.htm

STANDARDS ALIGNMENT

NGSS STANDARDS

Three-dimensional Learning

- **HS-ETS1-1** - Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
    - Science and Engineering Practices
        - Asking Questions and Defining Problems
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.A: Defining and Delimiting Engineering Problems
    - Crosscutting Concepts
        - Systems and System Models
        - Influence of Science, Engineering, and Technology on Society and the Natural World
- **HS-ETS1-3** - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
    - Science and Engineering Practices
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.B: Developing Possible Solutions
    - Crosscutting Concepts
        - Influence of Science, Engineering, and Technology on Society and the Natural World

- **HS-ETS1-4** - Use a computer simulation to model the impact of proposed solutions to a complex real- world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
    - Science and Engineering Practices
        - Using Mathematics and Computational Thinking
    - Disciplinary Core Ideas
        - ETS1.B: Developing Possible Solutions
    - Crosscutting Concepts
        - Systems and System Models

COMMON CORE STATE STANDARDS

- **RST.9-10.1** - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- **RST.9-10.2** - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **RST.9-10.4** - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **SL.9-10.1.C** - Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- **WHST.9-10.2** - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **WHST.9-10.4** - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **WHST.9-10.6** - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- **WHST.9-10.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- **WHST.9-10.9** - Draw evidence from informational texts to support analysis, reflection, and research.

REFERENCES

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