Grades: 6
Subjects: Career and Technical Education, Science, Common Core: ELA Literacy in Science and Technical Subjects
Time Required: 1 50-60 minute class period
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OVERVIEW
In this lesson, students explore the process and development of the Wright brothers’ earlier flying apparatus leading up to and including their first sustained, controlled flight of 1903. They will analyze images from the Library of Congress Web site related to the Wright brothers’ aviation and investigate the flight process of the Wright brothers and the important steps they made during their design process.

GOAL
Students will study the history of the Wright brothers and understand the engineering design process.

OBJECTIVES
The learner will explore the early flight process of the Wrights, explore images from the Library of Congress Web site related to the subject matter that they are studying, and complete picture analysis worksheets. Each group will investigate one of the steps in the flight process and combine that step with other steps to produce a timeline of the important steps the Wright brothers made during their design process.

INVESTIGATIVE QUESTION
How did the Wright brothers’ methodical, systematic process in building the airplane demonstrating the steps in the engineering design process?

CURRICULUM STANDARDS
Career and Technical Education - 6th grade - Exploring Technology
Standard 3.0
3.2 Understand basic manufacturing and its impact on our society.
Standard 4.0
4.3 Utilize computer technology to access and retrieve data.
4.4 Use the Engineering Design Process to solve design challenges in transportation.

6th grade Science: Embedded Technology and Engineering
GLE 0607.T/E.2 Know that the engineering design process involves an ongoing series of events that incorporate design constraints, model building, testing, evaluating, modifying, and retesting.
(SPI) 0607.T/E.2 Evaluate a protocol to determine if the engineering design process was successfully applied.

(Continued on p. 2)
CURRICULUM STANDARDS (CONT.)

Common Core: ELA Literacy in History/Social Studies, Science, & Technical Subjects: Science & Technical Subjects Grades 6-8

CCSS.ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-Literacy.RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

RESOURCES:

Library of Congress Resources

“[…] Orville soaring in level flight […]” [1911] http://www.loc.gov/pictures/item/00652086/


[Exterior view of the Wright Company factory; Dayton, Ohio] [1911]

[Left side view of the 1900 Wright glider before installation of forward horizontal control surface, flying as a kite, tipped forward; Kitty Hawk Lifesaving Station and Weather Bureau buildings in background to the left] http://www.loc.gov/pictures/item/2001696450/

[1901 glider being flown as a kite, Wilbur at left side, Orville at right; Kitty Hawk, North Carolina] http://www.loc.gov/pictures/item/2001696466/

[Side view of Dan Tate, left, and Wilbur, right, flying the 1902 glider as a kite] http://www.loc.gov/pictures/item/2001696561/

[First flight, 120 feet in 12 seconds, 10:35 a.m.; Kitty Hawk, North Carolina] http://www.loc.gov/pictures/item/00652085/

General Correspondence: Smithsonian Institute, 1899-1909 http://www.loc.gov/item/wright002544

Otto Lilienthal glider, 1895 http://www.loc.gov/pictures/item/2001696482/

Family papers: Correspondence – Wright, Katherine, 1910 http://www.loc.gov/item/wright002280

[Start of a glide; Wilbur in motion at left holding one end of glider (rebuilt with single vertical rudder), Orville lying prone in machine, and Dan Tate at right; Kitty Hawk, North Carolina] http://www.loc.gov/pictures/item/00652084/

[Wilbur in prone position in damaged machine, on ground after unsuccessful trial of December 14, 1903, Kitty Hawk, North Carolina] http://www.loc.gov/pictures/item/2001696254/


Other Resources

NASA: Models of the Wright Brothers’ Aircraft (1900-1903) http://wright.nasa.gov/ROGER/models.htm

Wright Brothers’ Test Flight, 1909 Video http://www.history.com/topics/inventions/wright-brothers/videos/wright-brothers-test-flight-1909

Wilbur Wright’s sketches of the 1899 kite http://www.wright-brothers.org/History_Wing/Wright_Story/Inventing_the_Airplane/Warped_Experiment/Warped_Experiment_images/1899_Kite_Illustrations.jpg
MATERIALS
- PowerPoint presentation
- Engineering Design Process Worksheet (H1)
- Picture Analysis Worksheet (H2)
- Picture Bibliography Page Worksheet (H3)
- Poster Board (cut in half, long ways)

PROCEDURE

Step 1: Introduction: Watch the video clip Wright Brothers’ Test Flight, 1909. Use the PowerPoint presentation as a guide for the lesson and to facilitate the discussion of the following questions:
1. Ask, “What do you observe in this video?”
2. Ask, “What do you know about the Wright brothers?”
3. Ask, “What questions do you have about the video?”

Step 2: Review the Engineering Design Process. The learner will complete Part 1 on the Engineering Design Process Handout (H1) by filling in the name of each step. (Part 2 is completed during the Conclusion section)

Engineering Design Process
1. Identify the Problem
2. Brainstorm and Research
3. Design a Plan
4. Create a Model or Prototype
5. Improve the Model or Prototype
6. Manufacture the Product

Step 3: Guided Practice: Use the overhead projector or provide copies of the image “Side view from below of Orville soaring in level flight, spectators looking up at glider; Kitty Hawk, North Carolina” [First flight, 120 feet in 12 seconds, 10:35 a.m.; Kitty Hawk, North Carolina] [1903 Dec. 17]. Students work independently or with partners and complete the Picture Analysis Worksheet (H2) and Picture Bibliography Page Worksheet (H3). Upon completion of the worksheets, have each student tell the class what they discovered in the image.

Step 4: Independent Practice: Students in small groups will review the time line of the Wright brothers at [Before or after each image] http://www.loc.gov/collections/wilbur-and-orville-wright-papers/articles-and-essays/the-wilbur-and-orville-wright-timeline-1846-to-1948/

Provide one of the following images for each group to study. As a group, complete another Picture Analysis Worksheet (H2) and Picture Bibliography Page Worksheet (H3):
- 1900 Glider: [Before or after each image] http://www.loc.gov/pictures/item/2001696450/
- 1901 Glider: [Before or after each image] http://www.loc.gov/pictures/item/2001696466/
- 1902 Glider: [Before or after each image] http://www.loc.gov/pictures/item/2001696561/

Each group will copy the image to a MS Word document, resize pictures to 6”x6”, write at least a four sentence caption under each picture, and print.

Groups will paste their images onto the poster board to create a timeline illustrating the evolution of the Wright brothers’ flying machines.
### Step 5: Sharing
Display the timeline in the front of the classroom. Have each group discuss their image and what they learned from analyzing the image.

Ask: “How has this human technology changed our lives today?” Allow for discussion.

### Step 6: On the overhead display images of various points in the Wright brothers’ methodical, systematic process in building the airplane. Have each student match the image according to the step in the engineering design process (H1).

#### Engineering Design Process

1. **Identify the Problem** [http://hdl.loc.gov/loc.mss/mwright.03207](http://hdl.loc.gov/loc.mss/mwright.03207)
   
   The Wright brothers wanted to solve the problem of human flight.

   
   The Wright brothers studied prior attempt at flight and bicycle mechanics.

3. **Design a Plan** [http://www.wright-brothers.org/History_Wing/Wright_Story/Inventing_the_Airplane/Warped_Experiment/Warped_Experiment_images/1899_Kite_Illustrations.jpg](http://www.wright-brothers.org/History_Wing/Wright_Story/Inventing_the_Airplane/Warped_Experiment/Warped_Experiment_images/1899_Kite_Illustrations.jpg)
   
   The Wright brothers designed a flying machine.

4. **Create a Model or Prototype** [http://www.loc.gov/pictures/item/00652084/](http://www.loc.gov/pictures/item/00652084/)
   
   The Wright brothers’ first prototype was the 1900 glider.

5. **Improve the Model or Prototype** [http://www.loc.gov/pictures/item/2001696254/](http://www.loc.gov/pictures/item/2001696254/)
   
   The Wright brothers improved their design with the 1901 glider, 1902 glider and the 1903 flyer.

   
   The Wright brothers began the Wright Company.

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[Willbur in prone position in damaged machine, on ground after unsuccessful trial of December 14, 1903, Kitty Hawk, North Carolina] [1903 Dec. 14]  
[Side view from below of Orville soaring in level flight, spectators looking up at glider; Kitty Hawk, North Carolina] [1911 Oct.]
EVALUATION

Use the following rubric to evaluate student participation in group work and discussion.

- Class participation (50 pts)
- Completing the Image Worksheet (25 pts)
- Group Image (25 pts)

EXTENSIONS

- Investigate the Library of Congress for more images related to the history of flight.
- Watch and discuss the video “Who Really Invented the Airplane?" [http://www.history.com/topics/inventions/wright-brothers](http://www.history.com/topics/inventions/wright-brothers)
- Have students create their own Wright gliders using cardboard and toothpicks. [http://wright.nasa.gov/ROGER/models.htm](http://wright.nasa.gov/ROGER/models.htm)
- Additional Library of Congress Flight Resources on earlier flight for study:

  - Deaths from Flying [http://hdl.loc.gov/loc.mss/mwright.0500511](http://hdl.loc.gov/loc.mss/mwright.0500511)
  - Women in flight [http://hdl.loc.gov/loc.mss/mwright.0500566](http://hdl.loc.gov/loc.mss/mwright.0500566)
  - Clouds obstructing view [http://hdl.loc.gov/loc.mss/mwright.05003418](http://hdl.loc.gov/loc.mss/mwright.05003418)
  - Wrights May Stop All Plane Flyers [http://hdl.loc.gov/loc.mss/mwright.05002594](http://hdl.loc.gov/loc.mss/mwright.05002594)
  - Roosevelt first former president to fly [http://hdl.loc.gov/loc.mss/mwright.05003393](http://hdl.loc.gov/loc.mss/mwright.05003393)
1. Fill in the name of each step of the Engineering Design Process.

2. Give an example of the Wright Brothers carrying out each step.

Step 1 – ________________________
_______________________________________________________________________
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_______________________________________________________________________

Step 2 – ________________________
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Step 3 – ________________________
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Step 4 – ________________________
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Step 5 – ________________________
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Step 6 – ________________________
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<th>What prior knowledge helps you understand what you see?</th>
<th>What do you observe?</th>
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**Name ________________________**

**Grade __________**

**Period ________**

**WRIGHT PICTURE ANALYSIS WORKSHEET (H2)**
Name ___________________   Period _______   Grade _______

Name of Picture _______________________________________________________

Creator ____________________________________________________________

Date ______________

Is there additional information relevant to what we have been studying?  Yes  No

If so, what? __________________________________________________________

_______________________________________________________________________

_______________________________________________________________________

Did the Biographical Page answer any of your questions?  Yes  No

If so, what? __________________________________________________________

_______________________________________________________________________

_______________________________________________________________________