

# Teacher Tool 743: Program Guide for Full STEAM Ahead with the Moon Landing Challenge

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## Full STEAM Ahead with the Moon Landing Challenge

**Original Program Date: October 17, 2019**

**Grade Levels: 4-8**

### **Program Description:**

Commemorating the 50<sup>th</sup> anniversary of America's moon landing and NASA's renewed focus in returning to the moon, we invite you and your students to investigate the challenges and opportunities offered by a moon landing challenge. Mrs. Blumer's 6th and 7th grade science students from Greenville Jr. High School (Greenville, IL) share their solutions to challenges in creating a lunar lander, lunar rover, space suit (Barbienneaut), rocket and successful heat shield that will all be needed for NASA's return to the moon.

In addition to investigating the moon landing challenge, students learn from Alec Herzog, an engineer from the American Institute of Aeronautics and Astronautics. This segment of the program focuses on the various careers available in aerospace engineering and the importance of teamwork and collaboration in solving an engineering problem.

### **Program Objectives:**

1. The participant will learn about the importance of teamwork and collaboration in solving an engineering problem.
2. The participant will think like an engineer and a scientist.
3. The participant will explore science, technology, engineering, and math used to plan and successfully execute a moon landing.
4. The participant will engage in critical thinking and creative thinking.

### **Program Format:**

The agenda below provides you the topics to be explored in the program as well as the order of that exploration. Student questions are woven in throughout the program.

**I. Welcome and Introduction**—Student groups and experts are introduced and welcomed to the program and given information on ways to interact during the program.

**II. What does an Aerospace Engineer do?** Alec Herzog from the American Institute of Aeronautics and Astronautics shares images and information showing the variety of careers a person could pursue in aerospace engineering and also discusses the importance of teamwork and collaboration in working as an engineer.

**III. Solving the Moon Landing Challenge**—Students hear from students in Ms. Blumer's classroom as they offer their solutions to four specific design challenges that NASA engineers will face as they seek to return man to the moon. The four challenges are to develop the best they can of the following: an astronaut suit that will protect in space and on the lunar surface, a lunar lander that can successfully land on the moon, a lunar rover for use on the moon, and a heat shield to ensure successful return to Earth.

**IV. Summary and Closing**—We summarize the major concepts learned and deal with final questions from students.

**Related Activity Suggestions:**

Use the web resources below to get students thinking more about topics explored in the program and as preparation for utilizing Ms. Blumer’s lesson plan ideas also available on our website in Teacher Tool 748: Space Engineering Design Challenge Lesson Plan and Resources.

**1. How does a spacesuit work?**

[https://www.nasa.gov/audience/forstudents/nasaandyou/home/spacesuits\\_bkgd\\_en.html](https://www.nasa.gov/audience/forstudents/nasaandyou/home/spacesuits_bkgd_en.html)

<https://science.howstuffworks.com/space-suit.htm>

**2. How Does a Lunar Lander Work?**

<https://science.howstuffworks.com/apollo-spacecraft6.htm>

<https://www.theverge.com/2019/4/10/18304654/lockheed-martin-lunar-lander-concept-moon-2024-nasa>

[https://en.m.wikipedia.org/wiki/Lander\\_\(spacecraft\)](https://en.m.wikipedia.org/wiki/Lander_(spacecraft))

**3. What is the Lunar Surface Like?**

<https://www.space.com/19582-moon-composition.html>

<https://science.howstuffworks.com/moon1.htm>

**4. How Do Lunar Landers Work?**

<https://science.howstuffworks.com/lunar-rover.htm>

[https://nssdc.gsfc.nasa.gov/planetary/lunar/apollo\\_lrv.html](https://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_lrv.html)

**5. How Do Heat Shields Work?**

<https://cosmosmagazine.com/technology/how-do-heat-shields-spacecraft-work>

[https://en.wikipedia.org/wiki/Heat\\_shield](https://en.wikipedia.org/wiki/Heat_shield)

<https://moon.nasa.gov/observe-the-moon/viewing-guide/what-can-i-see-on-the-moon/>

**Supplemental Resources:**

NASA Website on the Apollo 11 Mission:

[https://www.nasa.gov/mission\\_pages/apollo/missions/apollo11.html](https://www.nasa.gov/mission_pages/apollo/missions/apollo11.html)

National Air and Space Museum Website on the Apollo 11 Mission:

<https://airandspace.si.edu/explore-and-learn/topics/apollo/apollo-program/landing-missions/apollo11.cfm>

NASA Website on the Artemis Mission to Return to the Moon:

<https://www.nasa.gov/artemis>

**Featured National Standards:**

**Common Core Standards for English/Language Arts and Literacy in History/Social Studies, Science and Technical Subjects**

**College and Career Readiness Anchor Standards for Reading**

7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

### **College and Career Readiness Anchor Standards for Writing**

6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

### **College and Career Readiness Anchor Standards for Speaking and Listening**

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

### **Common Core State Standards Initiative**

#### **English Language Arts Standards—Literacy in Science and Technical Subjects**

##### **Grades 6-8**

##### **Integration of Knowledge and Ideas:**

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.6-8.8

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

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.

##### **Grades 9-10**

##### **Integration of Knowledge and Ideas:**

CCSS.ELA-LITERACY.RST.9-10.7

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CCSS.ELA-LITERACY.RST.9-10.8

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

### **Featured National Standards: (Science)**

**Science as Inquiry** - Science as inquiry requires students to combine processes and scientific knowledge with scientific reasoning and critical thinking to develop their understanding of science.

1. Abilities necessary to do scientific inquiry
2. Understandings about scientific inquiry

### **Next Generation Science Standards**

#### **Engineering Design**

**MS-ETS1-1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.