AIP
Center for History of Physics

Lesson Plan
Meet Four Pioneering African American Astronauts

Clockwise from top left: Michael P. Anderson, Ronald E. McNair, Guion S. Bluford Jr., Jeanette J. Epps, Images Courtesy of Wikimedia Commons.

Grade Level(s): 9-12	Subject(s): History, Contemporary

In-Class Time: 50 - 60 min	Prep Time: 10-15 min

Materials

Access to these documents either over the internet or in printout form:

- Photocopies of NASA Facts http://www.nasa.gov/pdf/286592main_African_American_Astronauts_FS.pdf.
- Photocopies of NASA Ronald E. McNair Biography, http://www.jsc.nasa.gov/Bios/htmlbios/mcnair.html
- Photocopies of NASA Michael Anderson Biography, http://www.jsc.nasa.gov/Bios/htmlbios/anderson.html.
- Photocopies of NASA Jeanette J. Epps Biography, http://www.jsc.nasa.gov/Bios/htmlbios/epps- jj.html.
- Photocopies of NASA Guion S. Bluford, Jr. Biography, http://www.jsc.nasa.gov/Bios/htmlbios/bluford-gs.html.

Objective

This lesson focuses on four astronauts and scientists who have a background in physics or a related discipline – Ronald E. McNair, Michael Anderson, Guion S. Bluford Jr., and Jeanette J. Epps. A link to a list of some African American astronauts is included in the Required/Recommended Reading and Resources section along with a website dedicated to providing biographies on all current and retired astronauts.

Introduction

The history of NASA, like all American institutions, must always be contextualized within the larger framework of American society. Before the middle of the twentieth century, racism and segregation barred most African Americans from being able to work at NACA, the National Advisory Committee for Aeronautics and the predecessor of NASA. But since World War II, African Americans have played an increasingly integral role in the research and operations of NASA, from the support staff on the ground, to engineers and scientists, to the astronauts who selflessly risk their lives on every trek into space. Before the end of legalized segregation, many African American engineers and scientists were performing scientific work for NASA at a time in which it was against the law for them to use the same bathroom as their white co-workers.[1]

The NASA Astronaut Corps was formed in 1959. The first astronaut candidates were selected in 1959 for Project Mercury, the goal of which was to successfully orbit astronauts around the Earth. After an intense screening process within the military, NASA selected the "Mercury Seven" – Alan Shepard, Gus

[1] For more information on integration at NASA, see Richard Paul, "How NASA Joined the Civil Rights Revolution," *Air & Space Magazine*, March 2014, http://www.airspacemag.com/history-of-flight/how-nasa-joined-civil-rights- revolution-180949497/?no-ist.

Grissom, John Glenn, Scott Carpenter, Wally Schirra, Gordon Cooper, and Deke Slayton. The first African American chosen to be an astronaut was Air Force Major Robert H. Lawrence in the 1960s.

He had earned a doctorate in physical chemistry from Ohio State University in 1965. Tragically, Lawrence died in a plane crash at Edwards Air Force Base, California on December 8, 1967. It was not until 1983 that Guion Bluford became the first African American in space. In this lesson plan, students will meet Guion Bluford and three other African American astronauts with backgrounds in physics or a related discipline – Ronald McNair, Michael Anderson, and Jeannette Epps. They are four of the many African Americans who contributed to NASA's work with human spaceflight since World War II.

Instructions/Activities

Divide the class into four groups and assign each group one of the astronauts. Give each group the printouts of the NASA biographies. Students will carefully read the biographies of each astronaut. Encourage the students to reflect upon the reading and write down anything that comes to mind concerning how race affected the lives, education, and careers of the astronauts. Let the students do some further research on the astronauts and the time periods in which they lived. The groups will then give a presentation on the astronaut they learned about to the class.

Engage: 10 minutes

Understanding the social context around an organization can help students understand why it might be more difficult for certain people to work within that organization. For instance, before the middle of the twentieth century, racism and segregation barred most African Americans from being able to work at NACA, the National Advisory Committee for Aeronautics and the predecessor of NASA. However, since World War II, African Americans have played an increasingly integral role in the research and operations of NASA. Have students brainstorm/recall some of the hardships that African Americans might have experienced before they were allowed to work at NACA and during earlier years of working at NASA.	
What is the teacher doing? Divide students up into four or eight groups. These groups will be used for this brainstorming activity and for the exploration portion of the lesson.	**What should the students be doing?** Students should be gathering into four or eight groups.
Have students discuss with their groups for 3 or 4 minutes some ideas about the following: • Difficulties that African Americans would have faced before the Civil Rights Movement • Difficulties that African Americans faced after the 1964 Civil Rights Act Have the students think about how civil rights events would have impacted the lives of the African American scientists.	Students should be discussing with their group about the topics given. At the end of 3 or 4 minutes students should have a handful of ideas written down and be ready to discuss with the class.
Have each group of students share out a few of the ideas that they generated for each of the categories. Be sure to clarify any misconceptions about dates or events.	Students will share out a few of their ideas and ask questions if unclear about the time period or about events that might have taken place.

Explore: 30 minutes

African Americans have played a central role in NASA through many different positions. This lesson plan will only focus on those who have served as astronauts and who have a physics background. Students will take a look at the case studies of four astronauts in order to learn more about their roles as NASA astronauts. This can result in a presentation given by each group on their astronaut. Other ideas for projects based upon these astronauts are included in the elaboration section of this lesson plan.	
What is the teacher doing? Assign each group one of the four astronauts. Students can either use a computer to access the biographies or be given a handout. Ask students to read the biographies as a group.	**What should the students be doing?** Students should be carefully reading the biography that they were assigned. They will be writing down any questions that they have about the reading. These questions can be answered by the teacher or through further research.
Encourage the students to reflect upon the reading and write down anything that comes to mind concerning how race affected the lives, education, and careers of the astronauts.	Students should take some time to reflect with their group after they have completed reading the case study. Students should strive to make connections with the previously brainstormed events and the biography that they just read.
Have students work in their groups to create a short presentation about their astronaut. Key information about personal and professional life should be included as well as any historical events that might have affected their life. Additional research will be necessary.	Students should work with their group to create a short (no more than 5 minutes long) presentation. The presentations can be purely oral or they could include another component such as a PowerPoint that can provide visuals.

Explain: about 20 minutes depending on number of groups

Now that students have read the case study and possibly done additional research, have each group present their findings to the class. This will allow for every student to learn about all four astronauts and have the opportunity to ask questions about working as an African American astronaut.	
What is the teacher doing? Have each group of students give their presentation on their assigned astronaut. Allow for time after each presentation for questions from other students.	**What should the students be doing?** Students should present about a 5 minute presentation with their group based upon their assigned astronaut. If there are any questions asked that cannot be answered by the students, then students should turn to teachers for support.

Elaborate: included in explanation

Elaboration comes naturally during the explanation portion of this lesson. While students are discussing ideas and answering discussion questions, the teacher can interject with more information, clarification, or historical context to help ideas become clearer.	
What is the teacher doing? Make sure to participate in discussion and to clarify any troubling spots that come up. You can use the provided discussion questions to help generate conversation.	**What are the students doing?** Students are participating in the discussion that is described in the Explore section. Students should ask for clarification on any ideas or concepts that they do not understand.

Evaluate:

Below are some ideas for extensions that could be added or modifications that could be applied to this lesson plan to use as evaluation beyond the evaluation that can occur just from their presentations.

Research Paper: This lesson can be extended to include a research project. The students can research different NASA astronauts and write a short biography. The presentation component of the lesson plan could be included at the end of the research project so that students can present the details found during research.

Role Play: Each student should be assigned to a group of four with each student in the group being assigned a different astronaut. After a period of researching their astronaut, students could participate in a role play exercise within their group instead of giving a presentation. To role play, they could be put in the situation of explaining how they got to be astronauts and what they did once they were astronauts.

Required/Recommended Reading and Resources

NASA Biographies:

- Lyndon B. Johnson Space Center. "Astronaut Bio: Ronald E. McNair (12/2003)." Astronaut Bio: Ronald E. McNair (12/2003). http://www.jsc.nasa.gov/Bios/htmlbios/mcnair.html (accessed June 18, 2014).
- Lyndon B. Johnson Space Center. "Astronaut Bio: Michael P. Anderson (5/2004)." Astronaut Bio: Michael P. Anderson (5/2004). http://www.jsc.nasa.gov/Bios/htmlbios/anderson.html (accessed June 18, 2014).
- Lyndon B. Johnson Space Center. "Astronaut Bio: Jeanette J. Epps (5/2012)." Astronaut Bio: Jeanette J. Epps (05/2012). http://www.jsc.nasa.gov/Bios/htmlbios/epps-jj.html (accessed June 18, 2014).
- Lyndon B. Johnson Space Center. "Astronaut Bio: Guion S. Bluford, Jr. (2/2012)." Astronaut Bio: Guion S. Bluford, Jr. (2/2012). http://www.jsc.nasa.gov/Bios/htmlbios/bluford-gs.html (accessed June 18, 2014).

Further Research Sources:

- NASA's African American Astronauts – A two-page document which contains short biographies and photographs for sixteen African American astronauts.
- NASA Astronaut Biographies – This is a comprehensive resource provided by NASA that provides biographies of current and former astronauts.
- Richard Paul, "How NASA Joined the Civil Rights Revolution," *Air & Space Magazine*, March 2014, http://www.airspacemag.com/history-of-flight/how-nasa-joined-civil-rights- revolution-180949497/?no-ist.
- Gubert, Betty Kaplan, Miriam Sawyer, and Caroline Fannin. *Distinguished African Americans in Aviation and Space Science.* Westport, CT: Oryx Press, 2002.
- Jones, Stanley P. and L. Octavia Tripp. *African-American Astronauts.* Mankato, MN: Capstone Press, 1998.

Discussion Questions

Discussion Questions can be found as a Handout with a corresponding Answer Key in the Supplemental Materials to this lesson plan.

1. How did the astronaut's backgrounds prepare them for their intensive training and space experiences?
2. Assume that you are an astronaut instructor training Ronald McNair, Michael Anderson, Guion S. Bluford, or Jeanette J. Epps. What advice would you give them?
3. All four astronauts have a background in physics or a closely related field. What other careers can you think of for which physics might prepare you well?
4. Compare and contrast this group of astronauts. What do they have in common? What makes each of them different?

Further Reading and Additional Resources

- Video - NASA Remembers Challenger (3 min, 49 sec) – This video discusses the tragic Challenger explosion of 1986 in which astronaut and physicist Ron McNair passed away.
- McNair, Carl S., and H. Michael Brewer. *In the spirit of Ronald E. McNair, astronaut: an*
- *American hero*. Atlanta, GA: Publishing Associates, 2005.
- Naden, Corrine. *Ronald McNair: Astronaut*. New York: Chelsea House Publishers, 1991.
- Haskins, James and Kathleen Benson. *Space Challenger: The Story of Guion Bluford.* Minneapolis: Carolrhoda Books, 1984.
- Jeffrey, Laura S. *Guion Bluford: A Space Biography.* Springfield, NJ: Enslow Publishers, 1998.
- Guion Bluford (The HistoryMakers ScienceMakers Video Archive A2013.165, requires a free account), interview by Larry Crowe, 05/09/2013, The HistoryMakers ScienceMakers Video Archive. http://www.thehistorymakers.com/biography/guion-bluford.
  The ScienceMakers Digital Archive contains an extensive oral history video interview with Guion Bluford in which he discusses his life, education, and career.

Extensions

Related AIP Teacher's Guides on Women and Minorities in the Physical Sciences:

- Other lesson plans on African Americans and Space:
  - African Americans in Astronomy and Astrophysics
  - Katherine Johnson, Christine Darden, and the West Area Computers: African American Women Mathematicians at NASA

Other Extensions:

- NASA "Train Like an Astronaut," http://www.nasa.gov/audience/foreducators/trainlikeanastronaut/home/#.V2g09LgrKUl
- Cape Cosmos, http://www.capecosmos.org/. Cape Cosmos is a fictitious space facility set in the 1950s and 1960s that students can tour to learn about the struggles and triumphs of women and African Americans working in the Space Program and NASA. The tour is narrated by African American astronaut Mae Jemison.

Common Core Standards

For more information on Common Core Standards, visit http://www.corestandards.org/.

Reading: Informational Text	
CCSS.ELA-LITERACY.RI.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.11-12.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
Speaking & Listening	
CCSS.ELA-LITERACY.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-LITERACY.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.11-12.4	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
History/Social Studies	
CCSS.ELA-LITERACY.RH.9-10.1	Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.
CCSS.ELA-LITERACY.RH.9-10.2	Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.
CCSS.ELA-LITERACY.RH.11-12.1	Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
CCSS.ELA-LITERACY.RH.11-12.2	Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and

Subject Writing	
CCSS.ELA-LITERACY.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

Next Generation Science Standards

For more information on the Next Generation Science Standards, visit http://www.nextgenscience.org/.

N/A