African American Explorers and Innovators: An Interdisciplinary Unit

Grades: 6-8

Introduction

In this three-day unit plan, students will expand their knowledge of lesser-known African Americans in history by examining their scientific contributions. Activities include researching technologies, creating an engineering prototype, and writing a short story or one-act play. Learner outcomes align with Common Core standards in literacy as well as science and engineering practices and crosscutting concepts from the Next Generation Science Standards. The unit is designed for students in grades 6-8 and can be modified as needed.

Objectives

By the end of the unit, students will be able to:

- Identify a challenge faced by a historical figure and the technology that provided the solution
- Use facts from informational texts to support claims
- Build/Draw a prototype of a piece of technology from history
- Write a short story or play that includes historical characters, facts and settings, but incorporates what would have been considered a “futuristic technology” at the time

Standards

Common Core State Standards

- WHST.6-8.7 – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- WHST.6-8.8 – Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and follow a standard format for citation.
- WHST.6-8.4 – Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose, and audience.
- W.6.8 – Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information sources.

- RL.7.9 – Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.

Next Generation Science Standards

- 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.
- MS-ETS1-4 – Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Materials

- Computer/laptop/tablet
- Access to one of EBSCO's Science Reference, Literary Reference, Biography Reference and History Reference databases
- Makerspace supplies: e.g. pipe cleaners, yarn, magnets, Legos, cardboard boxes, toilet paper rolls, batteries, LEDs, copper tape, etc.

Procedure

Day 1 – Introduction

1. Warm up: Define "innovation." Ask students to identify people who are/were innovators. (Possible responses: Steve Jobs, Bill Gates, Thomas Edison, Ben Franklin, etc.) Ask students if they can identify any innovators who are/were African American. Use this question to introduce African American History Month.)

2. Provide information about historically prominent African American explorers and innovators for students to read the night before. Students will choose one of the following and read a short biography about his/her life:
    - **Benjamin Banneker** (invented the clock and the sundial)
    - **George Washington Carver** (devised method of crop rotation; 300 uses for peanuts)
    - **Bessie Coleman** (aviation pioneer)
    - **Matthew Henson** (Arctic explorer)
    - **Mae Jemison** (engineer, physician, NASA astronaut)
    - **Lewis Latimer** (invented first telephone, improved light bulb)
    - **Garrett A. Morgan** (invented the gas mask and the traffic signal)

Search the following Accession Numbers in Biography Reference Source or Biography Reference Ultimate to access reliable articles from Salem Press. Additional articles can be found in History Reference Source or History

Reference Ultimate. Choose the articles that best suit your student's reading level or ask your students to choose the article that best matches their Lexile® range.

Examples:

Benjamin Banneker

- AN 55596838 (Great Lives from History: African Americans) (1220)
- AN 32403211 (Britannica) (1220)

George Washington Carver

- AN 51932157 (Great Lives from History: African Americans) (L1350)
- AN 35190763 (American National Biography) (L1170)
- AN 32405949 (Britannica) (L1460)
- AN 6946433 (50 American Heroes Every Kid Should Meet) (L790)

Bessie Coleman

- AN 55596778 (Great Lives from History: African Americans) (L1260)
- AN 15287174 (Great Neck) (L1260)
- AN 32406964 (Britannica) (L1080)

Matthew Henson

- AN 55596910 (Great Lives from History: African Americans) (L990)
- AN 32412690 (Britannica) (L1070)
- AN 6946445 (50 American Heroes Every Kid Should Meet) (L820)

Mae Jamison

- AN 55596921 (Great Lives from History: African Americans) (L1310)
- AN 32413998 (Britannica) (L1130)

Lewis Latimer

- AN 55596749 (Great Lives from History: African Americans) (1090)

Garrett A. Morgan

- AN 55596786 (Great Lives from History: African Americans) (L1120)
- AN 35195522 (American National Biography) (L1160)
- AN 34912548 (Biography Today) (L1320)

Directions to students: Choose an article to read about an African American explorer/innovator. While reading, answer these questions:

- Which challenges did this person face in his/her job?
- What technology/solution was available to him/her at that time in history?
- Can you come up with any questions of your own?

3. After the reading, students will share their questions. The teacher writes questions on the board for all students to review, including other questions as needed.

   Examples:

   - What do pilots do when there are mechanical problems with their plane?
   - How do pilots land planes without the engine?
   - How does an igloo stay warm?
   - How do explorers know where they are if they're in a place no one has ever visited before?
   - How does the space suit ensure an astronaut's survival?

As a class, review the questions and speculate answers based on prior knowledge. Emphasize to students the need for more research to understand the technology these explorers used to solve the challenges they faced in their jobs.

Day 2 – Get in the mindset of your chosen explorer or innovator.

1. Group students into teams based on the explorer they chose to read about. Through group discussion, students will identify which challenges their explorer/inventor faced in his/her job and choose one to examine in more depth. (Challenges must be solvable by technology, not social or cultural challenges.)

2. **Assignment:** Take good notes documenting your research process and submit your notes with a prototype of the technology you researched. Be sure to include names of everyone in your group. (Rubric provided.)

   Steps for students:

   1. Define the problem to be solved by technology.
   2. Identify the initial requirements a type of technology must fulfill in order to solve the problem.
   3. Identify a piece of technology that was vital to the work of your chosen explorer during his/her historic era.
   4. Research this technology using Science Reference Source/Ultimate and History Reference Source/Ultimate.

      (Note to teacher: Help students limit their result list to content that falls in their Lexile® range using the Lexile® limiter).

5. Based on your findings, refine the requirements of the technology solution to include more details.
6. Create a prototype (model, sketch, etc.)
7. Identify the limitations of this prototype and of the technology used by the explorer.
8. Describe a present-day technology that could be used as another solution to the problem.

Day 3 – Tell a story.

1. As a class, read a short story or play that incorporates the use of a technology that was considered futuristic at the time, or even now. Consider using one of these available from EBSCO's Literary Reference Plus or Literary Reference Ultimate database:

   Plays

   - Matthew Henson: Explorer of the Arctic (AN 57216337)
   - Bessie Coleman: Pioneer in Aviation (AN 23694846)
   - George Washington Carver: American Hero (AN 120432444)
   - George Washington Carver: Scientist (AN 9501233421)
   - Benjamin Banneker, Save Washington City! (AN 5838110)

   Short Stories

   - "The Pedestrian" by Ray Bradbury (AN 14825085)
   - "There Will Come Soft Rains" by Ray Bradbury (AN 67066413)
   - "A Loint of Paw" by Isaac Asimov (AN 16791844)

2. After the reading, ask students to reflect on the technology mentioned. As a class, discuss the technology described in the story, the problem or challenge this technology solves, and the solution requirements. Take some time to discuss with students how inclusion of these details can add depth and reality to the story.

   Discuss with students the perspective of the main characters and the fictional world in which they exist. Pose the following questions:
   - How did the technology available in the explorer's world differ from reality?
   - Consider the African American historic figures you learned about earlier. What would it be like for them to have had then the technology that is available to us now?

3. **Assignment:** Write an original short story (science fiction) or a one-act play

   Directions to students: Working individually or in groups, write a short story or one-act play about the African American explorer you chose on Day 1. (Rubrics provided.)
   - In your narration, describe the historic era and the define the problem your explorer needs to solve.

- Now imagine your explorer has access to today's technology. How would the explorer use this new technology to complete his or her job or solve the problem? Be sure to describe how this new technology meets the solution's requirements

Extension Activities

1. Students continue to refine their prototype and engineer a working model.
2. Students perform their plays or read their stories aloud to the class.

Assessment

1. **Formative Assessment:** Monitor student involvement in discussions and in building the prototype.
2. **Summative Assessment:** Using the rubrics provided, assess the group brainstorming report and the students' work of creative writing.

Research & Prototype Creation – Scoring Rubric

	Excellent – 4 pts	Good – 3 pts	Fair – 2 pts	Needs Work – 1 pt
Explorer's Challenges	Notes clearly describe 3-4 challenges faced by innovator/explorer.	Notes include 1-2 challenges faced by innovator/explorer.	Notes identify one challenge faced by innovator/explorer.	No relevant or accurate challenges identified.
Problem	Problem is clearly and carefully defined.	Problem is adequately defined.	Problem is weakly defined.	Problem is not defined.
Solution Requirements	Students clearly describe the requirements of the solution to the problem.	Students adequately describe the requirements of the solution to the problem.	Students somewhat describe the requirements of the solution to the problem.	Students did not describe the requirements of the solution to the problem.
Research	Students find 4 or more articles and record relevant information about the purpose of the technology, the problem it solves, and requirements.	Students find 2-3 articles and record information about the purpose of the technology, the problem it solves, and requirements.	Students find 1 article and record information about the purpose of the technology, the problem it solves, and requirements.	Students did not find articles or did not demonstrate an understanding of the articles they found.
Refined Requirements	Students made 3 or more changes to the requirements based on their research.	Students made 2 changes to the requirements based on their research.	Students made 1 change to the requirements based on their research.	Students did not change their requirements based on their research.
Prototype	Prototype accounts for each of the requirements and solves the problem as defined, shows evidence of trial and error to improve.	Prototype accounts for each of the requirements and solves the problem as defined.	Prototype accounts for only some of the identified requirements, but solves the problem as defined.	Prototype does not account for any of the identified requirements or does not solve the problem as defined.
Limitations	Identified 3 limitations of prototype and of the technology used by the explorer.	Identified 2 limitations of prototype and of the technology used by the explorer.	Identified 1 limitation of prototype and of the technology used by the explorer.	Identified no limitations of prototype and of the technology used by the explorer.
Current Technology	Identified 3 or more forms of present-day technology that could be used as another solution to the problem.	Identified 2 forms of present-day technology that could be used as another solution to the problem.	Identified 1 form of present-day technology that could be used as another solution to the problem.	Did not identify a form of present-day technology that could be used as another solution to the problem.
Overall Group Cooperation	Group members consistently work well together and demonstrate respect for each other's ideas and opinions.	Group members usually work well together and demonstrate respect for each other's ideas and opinions.	Group members generally work well together but not everyone's ideas or opinions are heard.	Group members did not work well together and/or did not use their time wisely.

Short Story – Scoring Rubric

	Excellent – 4 pts	Good – 3 pts	Fair – 2 pts	Needs Work – 1 pt
Setting	Many vivid, descriptive words are used to tell the reader when and where the story took place.	Some vivid, descriptive words are used to tell the reader when and where the story took place.	The reader can figure out when and where the story took place, but the author didn't supply much detail.	The reader has trouble figuring out when and where the story took place.
Characters *Main character *must be* your chosen explorer/innovator!	All characters are named, clearly described, and relevant to the story.	Most characters are named, described and relevant to the story.	Characters are named, but there are not enough details to help the reader know how they're relevant.	Some characters are named but may not be relevant; character descriptions are weak or missing.
Plot	Writer effectively uses the five elements of plot structure. The story is very well-organized. One idea or scene follows another in a logical sequence with clear transitions.	Writer uses five elements of plot structure adequately. The story is generally well-organized. One idea or scene may seem out of place. Clear transitions are used.	The story is a little hard to follow or is missing elements of plot structure. The transitions are sometimes not clear.	Ideas and scenes seem to be randomly arranged.
Overall Creativity & Effort	The story is very imaginative and contains many creative details and/or descriptions that contribute to the reader's enjoyment.	Some creative / imaginative details and/or descriptions contribute to the reader's enjoyment.	Few creative details and/or descriptions, but they distract from the story. The author has tried to use his/her imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.
Conventions	Spelling, grammar and usage are always correct.	One or two errors in spelling, grammar or usage.	More than two errors in spelling, grammar or usage.	Frequent errors in spelling, grammar and usage.

One-Act Play – Scoring Rubric

	Excellent – 4 pts	Good – 3 pts	Fair – 2 pts	Needs Work – 1 pt
Plot & Structure	The entire play takes place in one scene with a clear beginning, middle and end. Plot focuses on a single problem to be solved and is relevant to the lesson.	The play has a beginning, middle, and end. The entire play is one scene. Plot is relevant to the lesson.	Beginning, middle and end are somewhat unclear or plot points may become confusing. Scene changes are added unnecessarily.	Disorganized or nonsensical; no clear beginning, middle and/or end.
Dialogue	Sounds like real conversation with brief, overlapping speeches and some fragments; introduces conflict early in the play.	Is mostly realistic; characters speak appropriately.	Somewhat realistic. Lines may be wordy, or characters may speak too politely / formally.	Dialogue is extremely unrealistic and/or inappropriate.
Characters	Personality of characters is revealed primarily in dialogue; secondarily in action; minor characters serve as foils or help reveal personalities of major characters.	Personality of characters is revealed partially in dialogue; minor characters may be similar to one another, but each character has a reason to be in the scene.	Characters do not adequately reveal their personality through dialogue. It may be unclear why some minor characters are in the scene.	Characters are boring, one-dimensional, and/or unnecessary.
Overall Creativity & Effort	Your play is clever and entertaining and shows outstanding effort.	Your play shows adequate creativity and solid effort.	Your play shows some creativity and a fair amount of effort.	Your play shows little or no creativity and a lack of effort.
Conventions	Spelling, grammar and usage are always correct.	One or two errors in spelling, grammar or usage	More than two errors in spelling, grammar or usage.	Frequent errors in spelling, grammar and usage.