

Exploration: Then and Now Survival!

http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Survival_Lesson.html

Focus on Inquiry

In this lesson, students will work as a team to analyze and rank the importance of survival items in particular environments. They will compare their rankings to past rankings that were developed by history and astronomy experts. They will compare two different exploration environments such as the Earth and the moon and identify human needs for survival in these two different worlds.

Lesson Overview

The educational module Exploration: Then and Now examines four themes and compares exploration of the past and present. The module focuses on the settlement of Jamestown, the first permanent English-speaking colony in the New World, and NASA’s plans to return to the moon and reach for Mars. This lesson introduces students to exploration and survival in new worlds. It compares challenges faced by explorers through the ages, checking for prior knowledge about conditions for survival in 1607 Jamestown and on the Moon. (Overview was taken from activity website)

Duration Two 50-minute class periods	Setting classroom	Grouping Individual & small group	PTI Inquiry Subskills 3.1, 3.3, 3.4, 5.2, 5.3, 6.1, 7.1, 7.2, 7.3
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	5 min.	5.2	None	2	Use the quote, “Exploration is really the essence of the human spirit.” to engage students in a discussion about exploration.
Explore	30 min	3.1, 3.3, 3.4, 6.1, 7.1, 7.2, 7.3	None	3	Students take on roles of past explorers by choosing and ranking the importance of items to help them survive in the Jamestown settlement in 1607. They justify their choices based upon meeting survival needs in a harsh environment.
Explain	15 min.	3.3, 5.2, 6.1, 7.1, 7.2, 7.3	Overhead projector	3	The whole class discusses and compares the ranking of items proposed by each group. Then students individually respond to a journal prompt.
Expand	35 min.	3.1, 3.3, 3.4, 5.2, 6.1, 7.1, 7.2, 7.3	Overhead projector	3	Students take on the roles of future astronauts who are landing on the Moon in 2025. They work as a team to rank items for survival in this new world. They then compare the two survival challenges in the past to survival challenges of the future to develop a deeper understanding of exploration.
Evaluate	15 min.	3.3, 5.2, 5.3		3	Students identify common qualities of survival items for Jamestown in 1607 and future settlements on the moon.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

<p>National Science Education Standards – Inquiry</p> <ul style="list-style-type: none"> • Use appropriate tools and techniques to gather, analyze, and interpret data. • Develop descriptions, explanations, predictions, and models using evidence. • Recognize and analyze alternative explanations and predictions. • Communicate scientific procedures and explanations 
<p>National Science Education Standards – Earth Science</p> <p>The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.</p>
<p>Louisiana Grade Level Expectations – Inquiry</p>  <p>Grade 8 GLE#27 Recognize that science uses processes that involve a logical and empirical, but flexible, approach to problem solving (SI-M-B1) Grade 8 GLE#28 Recognize that investigations generally begin with a review of the work of others (SI-M-B2) Grade 8 GLE#29 Explain how technology can expand the senses and contribute to the increase and/or modification of scientific knowledge (SI-M-B3) Grade 8 GLE#34 Recognize the importance of communication among scientists about investigations in progress and the work of others (SI-M-B5) Grade 8 GLE#37 Critique and analyze their own inquiries and the inquiries of others (SI-M-B5) Grade 8 GLE#38 Explain that, through the use of scientific processes and knowledge, people can solve problems, make decisions, and form new ideas (SI-M-B6) Grade 8 GLE#39 Identify areas in which technology has changed human lives (e.g., transportation, communication, geographic information systems, DNA fingerprinting) (SI-M-B7) Grade 8 GLE#40 Evaluate the impact of research on scientific thought, society, and the environment (SI-M-B7)</p>
<p>Louisiana Grade Level Expectations Earth Science</p> <p>Grade 8 GLE#48 Communicate ways that information from space exploration and technological research have advanced understanding about Earth, the solar system, and the universe (ESS-M-C8) Grade 8 GLE#49 Identify practical applications of technological advances resulting from space exploration and scientific and technological research (ESS-M-C8)</p>

Materials List (per group)

Per student:

- Survival in Jamestown Scenario (p. 10-14)
- Survival on the Moon Scenario (p. 20-25)

Per group:

- Survival in Jamestown Ranking Answer Key (p. 15-18)
- Survival in Jamestown Three-Circle Venn Diagram (p. 19)
- Survival on the Moon Ranking Answer Key (p. 26-29)
- Survival on the Moon Three-Circle Venn Diagram (p. 30)

Advance Preparation

1. Print 3 Jamestown handouts: p. 10-19
2. Print 3 Moon handouts: p. 20-30
3. Read background information provided on activity website

Other Information

Learning Objectives

Students will:

- analyze and rank items based upon their importance for survival in a particular environment
- work as a team to come to a consensus about the importance of certain survival items
- compare team rankings to rankings developed by history and astronomy experts
- identify and compare human needs in two different exploration environments
- compare the differences in survival on Earth and the Moon.

Prior Knowledge Needed by the Students

None

Procedure

Engage (Taken from engage section of activity website)

1. Introduce the idea of exploration by discussing this quote with your students: “Exploration is really the essence of the human spirit.” —Frank Borman, Commander, Apollo 8 Mission
2. As a class, continue the discussion of exploration by presenting these questions:
 - Can anyone be an explorer? Name some past explorers. (Accept a wide array of answers to help set the stage that everyone can be an explorer.)
 - Why do you think humans explore? (Answers will vary.)
 - What are some of the limitations to exploration? (Time, money, resources, etc.)
 - When might exploration lead to settlement? (Settlements are established when there is sufficient food, water, shelter, space, climate, etc.)
 - What are some historical settlements and why were these sites chosen for settlement? (There are a variety of answers. Be sure to include Jamestown, the first permanent English settlement in America.)
 - Where might future settlements be placed and why might these future sites be chosen? (There are a variety of answers. Be sure to discuss that NASA plans to build settlements on the Moon.)

Explore (Taken from explore section of activity website)

1. Discuss the **Essential Question**: What are the most essential items for the survival of settlers and explorers in new worlds?
2. Ask students what they need to know before they can begin creating a list of essential items. The list of items is dependent upon the location and conditions of the new world.
3. This “Survival” challenge is based upon surviving in Jamestown in 1607. As a class, read and discuss the “Survival in Jamestown Scenario.” (Student handouts p. 10-14).
4. Ask students what they know about Jamestown and the environment the settlers chose for their new home after reading the scenario. Ask if students know anything more about Jamestown from prior reading or research. Help students organize this information in their journals using a chart similar to the chart on the activity website.
5. As a class, discuss how this environment would affect survival. For example, the site chosen for the Jamestown settlement was surrounded by brackish water. It is unsafe to drink brackish water. Continue the discussion by asking students what they might need to survive in these conditions. Help students organize this information in their journals.
6. Assign students roles as 17th-century explorers. Ask them to imagine that they just spent 144 days at sea and have arrived at the location that will be known as Jamestown. The students’ mission is to establish a permanent English settlement at this site.
7. Review the list of available items and discuss any items that might be unfamiliar. Inform the students that some of the images included are items that were actually found during archaeological digs. The artifact images are courtesy of the Colonial Historical National Park.
8. Ask students to independently rank the items listed from 1 to 15, identifying those items that would be most important for human survival in the harsh new environment at Jamestown. Items ranked with a low number (1 to 5) are the most valued. Items ranked with a high number (10 to 15) are least valued. Students should write a one- or two-sentence reason for their rankings.
9. Organize the students into small groups. After completing individual rankings, students will share their rankings with other members of the group and discuss their choices. Each team must agree upon a group ranking.
10. Ask each team to record their group rankings on an overhead transparency. Discuss the differences in the rankings and the reasons for the differences.
11. The Colonial Historical National Park historians developed two different rankings. Give each group a copy of both rankings and ask the group to analyze the differences between the historians’ rankings and their group’s rankings. (Student handouts p. 15-18).

12. Have students work as a team on the “Survival in Jamestown Three-Circle Venn Diagram” to organize the rankings of the two historians and their own group ranking. Students may include any items that are scored plus or minus one number of their choices as an agreement. For example: One expert ranked the musket as number 2 and one ranked it as number 3. For the Venn Diagram, students should consider the musket ranking as an agreement. If the group ranked the musket as a 1, 2, 3, or 4, the item can be placed in the center section where all three circles intersect. (Student handout p. 19)

Note: *Additional teaching strategies are provided in the exploration section of the activity website.*

Explain (Taken from explain section of activity website)

1. As a class, identify items that were ranked the same by each group and the experts. Discuss possible reasons for this similar ranking.
2. Create a list of items that were ranked more than plus or minus one number different by the student groups and experts. Discuss possible reasons for these differences.
3. Identify information that the group was missing that would have helped them rank some of the items.
4. Ask students to read and respond to the following journal question individually.
Journal Prompt 1: Important decisions, such as survival decisions, may require teamwork and are often best decided by a group. Choose one item that you ranked differently than anyone in your group or differently than the historians. What were your reasons for the original ranking? What were the reasons the other person gave for a ranking that was different than your ranking? Would your reasons change now? How? Why? Before writing, set up a table to help organize and compare your ranking, your reasoning for the ranking, and the reasoning of the other person.

Expand (Taken from extend section of activity website)

1. Return to the **Essential Question:** What are the most essential items for the survival of settlers and explorers in new worlds? As a class, summarize some of the essential items for survival in Jamestown in 1607 and ask students if they think any items on this list would also be essential for survival on the Moon. The next “Survival” challenge is based upon surviving on the Moon in 2025.
2. As a class, read and discuss the “Survival on the Moon Scenario.”
3. Ask students what they know about the Moon and the Moon’s environment after reading the scenario. Ask if students know anything more about the Moon from prior reading or research. Help students organize this information in their journals using a chart similar to the chart on the activity website.
4. As a class, discuss how this environment would affect survival. For example, there is little or no oxygen on the Moon. We need oxygen to live. Continue the discussion to help students understand what they might need to survive in these conditions. Help students organize this information in their journals.
5. Assign students roles as 21st-century explorers who are establishing a settlement on the Moon. Ask students how their experience in ranking the items for survival in Jamestown might help with this challenge.
6. Review the list of available items. Inform the students that some of the images included are items that would not usually be found on the Orion spacecraft, but they may include them in their survival ranking. These items are included to see if students can determine their importance in the lunar environment. Discuss any items that might be unfamiliar to the students.
7. Ask students to independently rank the items listed from 1 to 15, identifying those items that would be most important for human survival in the harsh new environment of the Moon. Items ranked with a low number (1 to 5) are the most valued. Items ranked with a high number (10 to 15) are least valued. Students should write a one- or two-sentence reason for their rankings.

8. Organize the students into small groups. After completing individual rankings, students will share their rankings with other members of the group and discuss their choices. Each team must agree upon a group ranking.
9. Ask each team to record their group rankings on an overhead transparency. Discuss the differences in the rankings and the reasons for the differences.
10. Two NASA scientists developed two different rankings. Give each group a copy of both rankings. Carefully examine the reasons each expert gave for his response. Ask the group to analyze the differences between the experts' rankings and their group's rankings.
11. Have students work as a team to complete a "Survival on the Moon Three-Circle Venn Diagram" to compare the results of the NASA experts to the group's rankings. Students may include any items that are scored plus or minus one number of their choices as an agreement. For example: One expert ranked a magnetic compass as number 14 and one ranked it as number 15. For the Venn Diagram, students should consider the magnetic compass ranking as an agreement. If the group ranked the magnetic compass as a 13, 14, or 15, the item can be placed in the center section where all three circles intersect.
12. Ask students to reflect on the difficulty of each survival situation. Was the second "Survival" activity easier or more difficult than the first? Why? Relate the students' experiences to explorers through the ages. (New explorers learn from the experiences of those who have explored before them, but survival requires adapting to new environments and finding solutions to new problems.)

Note: *Additional teaching suggestions are given in this section of the activity website.*

Evaluate

1. As a class, discuss the following questions, drawing upon experiences from this lesson:
 - Sir Isaac Newton is quoted to have said, "If I have seen further than others, it is because I have stood on the shoulders of giants." How might this quote relate to explorers and settlers? (Explorers and settlers learn from the experiences of others. The first people to travel or settle new worlds help pave the way for others to follow.)
 - What must explorers do before traveling to new worlds to prepare for their explorations? (It is important to know about and prepare for the environment of the new world. It is also helpful to learn from the experiences of other explorers.)
 - What challenges do explorers face when they travel to new worlds? (Explorers must be able to adapt to new environments and find solutions to new problems.)
 - What are the most essential items for the survival of settlers and explorers in new worlds? (Some essential items are items that help settlers and explorers travel, navigate, find and store food, offer shelter, find and store water, protect themselves and their environment, etc.)
 - What are the benefits and difficulties in making decisions as a group? (Group decision-making brings together more ideas and experiences to help solve a problem. It is sometimes difficult to build consensus and come to an agreement when working in a group.)
2. Ask students to write a paragraph to respond to one of the following journal prompts.

Journal Prompt 2: What are the most essential items for the survival of settlers and explorers in new worlds? Organize your writing by thinking about answers to these questions:

 - What do you need to know to survive in a new environment?
 - What are the differences and similarities in items that are most valuable for survival in Jamestown and on the Moon? Compare and contrast.
 - What are common qualities of these essential items for survival?
 - What are common qualities of unessential items for survival?
 - What can we learn about the basic needs of humans as new places are explored?

Journal Prompt 3: In addition to building a settlement on the Moon, NASA plans for humans to travel to Mars. Travel in space to Mars and beyond pushes the science of survival to a new level. Astronauts will encounter new problems that will require new solutions. Discuss what you think NASA will need to know and do before sending astronauts to Mars. Identify some items that would be essential for survival of settlers and explorers on Mars.

Note: *Additional teaching suggestions are given on the activity website.*

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- Survival in Jamestown Scenario Student Handout (Pages 10-14 of activity website)
- Survival in Jamestown Ranking Answer Key Student Handout (Pages 15-18 of activity website)
- Survival in Jamestown: Three-Circle Venn Diagram Student Handout (Pages 19 of activity website)
- Survival on the Moon Scenario student Handout (Pages 20-25 of activity website)
- Survival on the Moon Ranking Answer Key Student Handout (Pages 26-29 of activity website)
- Survival on the Moon: Three-Circle Venn Diagram Student Handout (Page 30 of activity website)

Supplementary Resources