

# **The Human Body in Space**

David Amidon

SCED 547

## Summary

In this lesson, students will analyze the impacts of space travel on the human body. Using a Nearpod presentation and the backdrop of a Mars Mission, students will be asked to think about how their basic life processes can be met in space. The lesson begins with interactive visual imagery of a spacewalking astronaut and the Earth/ Moon system to trigger student questions. Students then explore the rigors and life in space through a series of videos and readings. After an analysis of the NASA “Twins Study” and the “One Year Mission”, students examine the details of a possible Mars Mission through a reading of “Mars: Inside the High-Risk, High-Stakes Race to the Red Planet” from *National Geographic*. The lesson culminates with the students planning their own Mission to Mars and explaining how they will protect their astronauts.

## Total Time

~3-5 class periods (45 min each)

## Learning Outcomes

Students will be able to:

- Identify 3 ways space travel can negatively impact the human body.
- Explain how these factors would impact homeostasis.
- Describe the path of a Mars exploration voyage.
- Explain how the NASA “Twins Study” will help prepare future astronauts for space travel.
- Design a spacecraft and Mars housing to protect astronauts on their voyage to Mars.

## Standards:

See NGSS Matrix attached

## Overview:

Students will be provided with access to a presentation which will display the content in the PRESENTATION file (see .pdf). Originally created on the Nearpod platform (<https://share.nearpod.com/z7jf6b0nJW0>) , it provides students with immersive visuals, videos and links they will need to access. In the form of presentation used, the students will have access to the presentation on their device, but the teacher controls the content being viewed for all students. Students will work through questions provided in the HUMANS & SPACE TRAVEL PACKET (see .pdf) where they will be instructed to examine various images, videos or websites, in turn, that will outline the dangers associated with space flight and how NASA conducted the One Year Mission and the Twin Study to further analyze these dangers. Students will also access the *National Geographic* article, “Mars: Inside the High-Risk, High-Stakes Race to the Red Planet” separately. Finally, they will create a mock “Mission to Mars” based on this information provided to demonstrate how the results of the Twin Study will impact future planning for space missions. While most of these questions may be answered individually, the final product will require groups of two or more to work together. The length of the lesson will vary according to how long the teacher allows for examination of resources and completion of the culminating project.

## Teaching-Learning Plan: The Inquiry 5E Instructional Model

<b>Time</b>	<b>Teacher Does</b>	<b>Student Does</b>
<b>Engage (15 min)</b>	<ul style="list-style-type: none"> <li>● Distribute the Humans &amp; Space Travel packet</li> <li>● Begin Nearpod presentation               <ul style="list-style-type: none"> <li>● SLIDE 1 shows an astronaut who has “lost” a wrench</li> <li>● SLIDE 2 shows the earth &amp; Moon in 3-D</li> </ul> </li> <li>● Lead a discussion               <ul style="list-style-type: none"> <li>● Ask students what they are wondering/ thinking</li> <li>● Help remind what Life Processes are</li> <li>● SLIDE 3 instructs students to “post” their own questions or ideas about space travel</li> <li>● Discuss some of the responses as a class</li> </ul> </li> </ul>	<p><i>Students will finish page 1 of the packet for this part of the lesson. (Questions 1-5)</i></p> <p>Working through the Nearpod Slides 1-3, students will examine the visual images provided and come up with their own questions or thoughts about space travel based on the prompt: <b>What is so difficult about living in space?</b></p> <p>Individuals will post on the Nearpod “Bulletin Board” (see Space Responses.pdf)</p> <p>Students should skim through the responses, followed by a class discussion. Then, students should reflect and complete the questions before moving on.</p>
<b>Explore (25 min)</b>	<ul style="list-style-type: none"> <li>● Continue Nearpod               <ul style="list-style-type: none"> <li>○ SLIDE 4 is instructions</li> <li>○ SLIDE 5 is a video from the Canadian Space Agency</li> <li>○ SLIDE 6 is a series of links to articles and websites.</li> </ul> </li> </ul>	<p><i>Students will finish page 2 of the packet for this part of the lesson. (Questions 6-8)</i></p> <p>Students will explore various provided resources to learn about the dangers astronauts, scientists and engineers need to be aware of to survive in space. Resources are found on the DANGERS IN SPACE (.pdf).</p> <p>After learning about the dangers, students are asked to focus on determining how one of these factors would influence an astronaut's ability to maintain homeostasis. They are also asked to explain how they would test their hypothesis..</p>

<p><b>Explain (20 min)</b></p>	<ul style="list-style-type: none"> <li>● Continue Nearpod <ul style="list-style-type: none"> <li>○ SLIDE 7 is a link to the NASA Tumblr page that describes the NASA Twins Study.</li> <li>○ SLIDE 8 has a magnified view of the mission patch for the twins Study, as well as other links for the students to learn about what the results mean</li> <li>○ Be sure to steer conversation to the importance of having twins with identical DNA for comparison purposes.</li> </ul> </li> </ul>	<p><i>Students will finish page 3 of the packet for this part of the lesson. (Questions 9-12)</i></p> <p>Students are asked to examine the procedures established by the One Year Mission and the Twins Study and compare them to the hypothetical procedures they established in the previous section.</p> <p>Students are asked to analyze the mission patch for the Twins Study and explain how it symbolizes the mission.</p> <p>Students will also examine the findings of the Twins Study, summarize what was learned, and reflect on how this new information will influence future missions.</p>
<p><b>Elaborate (20 min)</b></p>	<ul style="list-style-type: none"> <li>● End Nearpod <ul style="list-style-type: none"> <li>○ SLIDE 9 shows a 3-D image of Mars that the students can explore</li> <li>○ As students interact, have a short discussion going back to the “notes” they posted on the Nearpod “wall”. What was learned, what new questions do they have?</li> </ul> </li> <li>● Provide a link to or copies of the <i>National Geographic</i> article “Mars: Inside the High-Risk, High-Stakes Race to the Red Planet”</li> </ul>	<p><i>Students will finish page 4 of the packet for this part of the lesson. (Questions 13 &amp; 14)</i></p> <p>In this section, establish partners that they will work with to produce their final project.</p> <p>The <i>National Geographic</i> article provides in depth information about a possible mission to Mars. Students are asked to examine missions take so long and to compare life on Earth, Mars and in Space. Finally, they should consider how the results of the Twins Study would influence mission planners going forward.</p>
<p><b>Evaluate (40 min)</b></p>	<ul style="list-style-type: none"> <li>● Share the partner project, Mission to Mars, with the students.</li> <li>● Briefly walk through the rubric.</li> </ul>	<p><i>Students will find the description and rubric for their Mission to Mars Project on page 5 &amp; 6 of the packet for this part of the lesson.</i></p> <p>Students will incorporate their new knowledge into planning a hypothetical mission to Mars, specifically focusing on how the spacecraft and housing would need to be designed to compensate for the factors found in the Twins Study.</p> <p>Students will be allowed to create their project in a format of their own choice.</p>

## Sources & References

- Achenbach, J. (2016, October 14). Mars: Inside the High-Risk, High-Stakes Race to the Red Planet. Retrieved from <https://www.nationalgeographic.com/magazine/2016/11/spacex-elon-musk-exploring-mars-planets-space-science/>
- Boddy, J. (2017, December 09). From shrinking spines to space fungus: The top five dangers of space travel. Retrieved from <https://www.sciencemag.org/news/2016/12/shrinking-spines-space-fungus-top-five-dangers-space-travel>
- Canadian Space Agency. (2017, November 28). Why do we science in space? Retrieved June 02, 2019, from <https://youtu.be/yOJGC5OEcDU>
- Maldarelli, C. (2019, April 15). What NASAs twin study actually taught us about living in space. Retrieved from <https://www.popsoci.com/g00/nasa-twin-study-results-microbiome-telomeres-genes?i10c.ua=1&i10c.encReferrer=&i10c.dv=18>
- Mars, K. (2018, March 27). 5 Hazards of Human Spaceflight. Retrieved from <https://www.nasa.gov/hrp/5-hazards-of-human-spaceflight>
- NASA. (2019, April 11). Two are Better Than One: The NASA Twins Study. Retrieved from <https://nasa.tumblr.com/post/184113631444/two-are-better-than-one-the-nasa-twins-study>
- Northon, K. (2019, April 11). NASA's Landmark Twins Study Reveals Resilience of Human Body in Space. Retrieved from <https://www.nasa.gov/press-release/nasa-s-landmark-twins-study-reveals-resilience-of-human-body-in-space/>
- Oswald, E. (2019, March 13). Here's All the Past, Present, and Future Missions to Mars. Retrieved from <https://www.digitaltrends.com/cool-tech/future-mars-missions/>
- Wei-Haas, M. (2016, March 01). What Happens to the Human Body in Space? Retrieved from <https://www.smithsonianmag.com/science-nature/what-happens-human-body-space-180958259/>