# Lesson Plan: What Happens to Your Body When You Go to Space?

Grade Level: 9th Grade Biology
Lesson 1 Duration: 35 minutes
Lesson 2 Duration: 45 minutes
Lesson Type: Research-Based, Interactive, Video-Driven

# **Objective:**

Students will explore the effects of space travel on the human body **with a focus on genetics** by investigating NASA's Twin Study (Scott and Mark Kelly). They will analyze how space travel alters gene expression and DNA, connect it to recent SpaceX missions, and discuss how genetics plays a role in human space exploration. They will use engaging videos, discussions, and group research to answer the overarching question: **"What happens to your body when you go to space?"** 

# Lesson 1: Space and Your Body (35 min)

## **Essential Question:**

What happens to your body when you go to space?

## Materials:

#### Videos:

- What Happens to the Human Body in Space? (7 min) <u>https://www.youtube.com/watch?v=1xQx5d0RI3M</u>
- Scott Kelly on What Space Did to His Body (4 min)<u>https://www.youtube.com/watch?v=p65XhPiZkyE</u>

Handouts for Group Research

# 1. Hook: Blast-Off! (~5-10 min)

- 1. Ask students:
  - "If you went to space tomorrow, how do you think your body would change?"
  - "Would you feel stronger or weaker? Taller or shorter?"

- What do you think happens to an astronaut's DNA in space?
- 2. Play **"What Happens to the Human Body in Space?"** <u>https://www.youtube.com/watch?v=1xQx5d0RI3M</u>
- 3. Have students brainstorm answers in pairs and share their ideas to the following:
  - "What happens to an astronaut's muscles and bones in space?"
  - "How does space affect blood flow and the heart?"
  - "What happens to an astronaut's immune system while in space?"

## 2. NASA's Twin Study: Scott vs. Mark Kelly (5 min)

- Show Scott Kelly on What Space Did to His Body (4 min). https://www.youtube.com/watch?v=p65XhPiZkyE
- Explain the **NASA Twin Study**: Scott spent **340 days in space**, while his twin brother Mark stayed on Earth.
- Ask and discuss: "Why do you think NASA studied identical twins for space research?"

# 3. Group Research Activity (20 min)

- Break students into **research teams**. Each group studies a different effect of space travel on Scott Kelly:
  - 1. **DNA & Gene Expression** How did Scott's genes change?
  - 2. Muscle & Bone Loss Why do astronauts lose strength?
  - 3. Vision & Brain Changes How does space affect eyesight?
  - 4. Immune System & Aging Did Scott Kelly age faster in space?
  - 5. **Telomeres & Aging** Why did Scott's telomeres (protective DNA caps) lengthen in space but shorten when he returned?
  - 6. **Epigenetics & Stress** How did the space environment switch certain genes on or off?
  - 7. **Immune System & Genetic Response** Why did Scott's immune system become more active in space?

## **Fach group will:**

- Research their topic.
- Answer:
  - "What effect does space have on astronauts related to your topic?"
  - "Why does this change happen in space?"
  - "What do you think scientists can do to fix or prevent this problem or is it a problem?"
- Prepare a **1-2 minute summary** to present in the next class.
- 4. Exit Ticket (5 min):

Students write:

- One thing they learned today about space & the human body
- One question they still have for next class

# Lesson 2: Surviving Space Travel (45 min)

## **Essential Question:**

How do astronauts return home, and what does this mean for future space travel? What do genetic changes in space mean for the future of human space travel?

#### Materials:

#### Videos:

- NASA's Twin Study Overview <a href="https://www.youtube.com/watch?v=SxjrgfBXxZ0">https://www.youtube.com/watch?v=SxjrgfBXxZ0</a> (4 min)
- <u>https://www.youtube.com/watch?v=fd-bMz4fGN4 (Live footage of splashdown)</u>

#### Group Research Presentations

## 1. Group Presentations (10-15 min)

- Each team presents their findings (1-2 minutes per group).
- After all groups present, class discussion:
  - Based on all group presentations, what do you think is the most difficult effect of space travel on astronauts? Why?
  - "How could we solve these space health problems?"

# 2. SpaceX: The Return to Earth (15 min)

- Show NASA Astronauts Return Home on SpaceX's Dragon. https://www.youtube.com/watch?v=fd-bMz4fGN4
- Discuss:
  - How do astronauts feel after returning home?
  - How does NASA help them recover from space effects?

## 3. What About Mars? (10 min)

- Play NASA's Twin Study Overview <u>https://www.youtube.com/watch?v=SxjrgfBXxZ0</u> (4 min)
- Class discussion:
  - "Could humans survive a trip to Mars?"
  - "What could we do to make space travel safer?"
  - "If we could edit human genes to help astronauts survive space travel, should we? Why or why not?"

# 4. Exit Ticket (5 min)

Students write a **one-paragraph response**:

"Would you go to space after learning about these effects? Why or why not?"

Have them write a **one-paragraph response**: Would you go to space after learning about these effects? Why or why not?

#### **Topic Sentence**

• Start with a clear sentence answering whether you would go to space (Yes or No).

#### **Supporting Reasons**

- Mention two genetic reasons that affect your decision to go to space.
- Explain each reason briefly, linking them to how space affects the human body.

#### Conclusion

• End with a statement that summarizes your decision and ties it to the reasons you provided.

## Assessment:

Group Research & Presentations – Did students explain their topic clearly? 15 pts
 Exit Ticket Responses – Did students show understanding of space and genetics effects?
 20 pts

Class Discussion Participation - 15 pts