IMAGINING LIFE BEYOND EARTH

Lesson 4: **Careers in Astrobiology**

OVERVIEW	This lesson introduces students to various career paths in astrobiology and related scientific fields. Students will explore how different scientific disciplines contribute to the study of life beyond Earth and reflect on their own skills and interests in relation to potential career paths. Duration: 45-60 minutes.
LEARNING OBJECTIVES	• Explore potential careers in astrobiology and related fields. • Understand how different scientific disciplines contribute to space exploration and the search for life. • Connect personal skills and interests to real-world scientific careers.
ARIZONA STANDARDS	**Core Ideas - U2:** The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. **6th Grade** - 6.E2U1.7 The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. This lesson also fulfills some of the Arizona Department of Education **Career Exploration Standards** for grade 6-8, including healthcare careers, education careers, science and technical careers, and the benefits of technology to careers and work.
NEXT GENERATION SCIENCE STANDARDS	• **MS-ESS1-3**: Analyze and interpret data to determine properties of objects in the solar system. • **Science and Engineering Practices - Asking Questions and Defining Problems** (Students explore scientific questions related to space missions and the search for extraterrestrial life) • **Science and Engineering Practices - Obtaining, Evaluating, and Communicating Information** (Students analyze how different scientific careers contribute to astrobiology and space exploration and reflect on how their own skills align with different scientific fields) • **Nature of Science (NOS) Connections - Science is a Human Endeavor** (Scientific discoveries result from collaboration between people of different backgrounds, disciplines, and expertise)
MATERIALS	• "What is Astrobiology?" video • Europa Clipper mission video • Mars Perseverance Video • Titan Dragonfly Video • "Imagining Life Beyond Earth" student booklets • Career Cards • Sticky notes (5 per student)

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BACKGROUND KNOWLEDGE

Students should have basic knowledge of the following:

- General knowledge of the planets in the solar system and their moons.
- The basic definition of astrobiology

VOCABULARY

- **Astrobiologist:** A scientist who studies the possibility of life beyond Earth.
- **Analogue:** In astrobiology, an analogue refers to an Earth-based environment, organism, or system that serves as a model for understanding conditions on other planets. For example, Antarctica's subglacial lakes are considered analogues for potential extraterrestrial habitats on icy moons like Europa.
- **Interdisciplinary Science:** A scientific field that combines multiple areas of expertise, such as biology, chemistry, and planetary science.
- **Instrumentation:** Tools and technology used in space missions to collect and analyze data.

SET UP

- Prepare video clips for class viewing.
- Ensure all students have their copy of "Imagining Life."
- Print career cards pages and cut into individual cards (optional)
- Distribute sticky notes to each student.

LESSON PROCEDURE

Warm Up

1. Review the Definition of Astrobiology.
    - Have students refer to the definition of astrobiology on page 10 in their booklets.
    - Explain that today they will refine their understanding by focusing on the different careers that contribute to astrobiology.

2. Watch the "What is Astrobiology?" video again. (This is the same video you watched in Lesson 1.) Ask students to listen for the four different components of astrobiology mentioned in the video.

3. Have students open their booklets to page 24, "The Four Components of Astrobiology" (Origin, Evolution, Distribution, and Future of Life). Facilitate a discussion:
    - What do these words mean?
    - Why do they matter in the study of astrobiology?
    - What types of scientists or careers might focus on each component?
    - Encourage students to write down key words or draw small illustrations to help them remember each concept.

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LESSON PROCEDURE

Activity 1: Missions in Astrobiology

4. Show this video clip about the **Europa Clipper** mission. Explore the following questions with the students as time and interest levels allow.
    - How does this mission relate to astrobiology?
    - Which of the four components of astrobiology does it connect to?
    - What types of careers are involved in this mission?
    - What analogue environments on Earth are similar to this environment?
    - What adaptations would an organism need to have to survive this environment?
    - What types of instruments is this space mission using to explore the possibility of life?
    - What challenges does this mission have?
5. Repeat Step 4 and the resulting discussion for the following video clips, as time allows:
    - Mars Perseverance Rover (also called the Mars 2020 Rover)
    - Dragonfly Mission to Titan

Activity 2: Career Exploration

6. Turn to page 25 in the booklet titled "About Me - Part 2"
    - Instruct the students to think of at least 5 strengths, skills, or interests that they have, and write them in their booklet.
    - Pass out 5 sticky notes to each student. Have the student write the same strengths/skills/interests on the sticky notes, one per sticky note.
7. Place the students into groups of 3-5 students each and pass out the career cards.
    - Instruct the students to read the career cards out loud as a group, discussing and asking questions as they go.
    - If they find a career that fits with one of their 5 strengths/skills, they should place that sticky note on the career card.
    - Encourage students to help each other place their sticky notes on careers that match.
    - After they have gone through all the careers, have each student choose the two careers they are most interested in, and fill in pages 26-27 in their booklets with:
        - The career name
        - How their skills connect with this career
        - A drawing of themselves practicing this career

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LESSON PROCEDURE	**Reflection** 8. Explore the following questions with the students as time and interest levels allow. You might also choose one of these questions as an "exit ticket" type of activity. ◦ What careers were the most exciting or unexpected? ◦ How do different careers in astrobiology work together? ◦ What careers did you explore that are not strictly "scientist" careers, but are still important to space missions? ◦ Notice that the career cards included people who work on manned space missions, but none of the missions we discussed (Europa, Mars, Titan) are manned missions. Why do you think this is so?
EXTENSIONS AND TAKE HOME ACTIVITIES	Here are some additional activities you might consider to extend the lesson or expand learning beyond the classroom. • Have students research a scientist working on one of the four components of astrobiology (Origin, Evolution, Distribution, Future) and present their findings. • Encourage students to interview a scientist or engineer (in person, via email, or by watching online interviews) and report back on what they learned. • Have students create a short story or comic about a future astrobiologist and their discoveries. • Have students take home the career cards and discuss with family members. Which careers do those family members like best? Which have matching skills or interests to those family members?