IMAGINING LIFE BEYOND EARTH

Preconceptions of Extraterrestrial Life

OVERVIEW	This lesson introduces students to the concept of extraterrestrial life by exploring fictional depictions and comparing them to real-world biological adaptations. Students will analyze how human experiences, environments, and cultures influence their ideas of extraterrestrial life. **Duration: 45-90 minutes.**
LEARNING OBJECTIVES	• Encourage students to think critically about life beyond Earth and its possible forms. • Help students identify key biological adaptations in fictional extraterrestrials. • Connect students' knowledge of ecosystems and adaptations on Earth to speculative astrobiology. • Develop students' ability to analyze how cultural factors shape perceptions of extraterrestrial life.
ARIZONA SCIENCE STANDARDS	**Core Ideas** - **U1**: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
NEXT GENERATION SCIENCE STANDARDS	• **Science and Engineering Practices - Analyzing and Interpreting Data:** Students are expected to analyze data systematically and recognize patterns, including potential sources of bias in data collection, representation, or interpretation. • **Nature of Science - Science is a Human Endeavor:** Scientific knowledge is a result of human inquiry, and as such, is influenced by social, cultural, and personal factors. • **Nature of Science - Science Addresses Questions About the Natural and Material World:** Many decisions are not made using science alone, but rely on social and cultural contexts.
MATERIALS	• Sci-Fi Extraterrestrials Slide Show (available on AABC website) • "Preconceptions of Extraterrestrial Life" worksheets - one per student (available on AABC website) • White board or scraps of paper for each group

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VOCABULARY

- **Organism:** A living thing, such as an animal, plant, or even tiny bacteria. Organisms need energy, grow, reproduce, and respond to their environment.
- **Extraterrestrial:** Any life form that comes from outside Earth.
- **Adaptation:** A physical or behavioral trait that helps an organism survive in its environment.
- **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.
- **Science Fiction (or "Sci-Fi")**: A type of storytelling that imagines futuristic technology, space exploration, or alien life, often based on scientific ideas. Movies like Star Wars or The Martian are examples of sci-fi.
- **Astrobiologist**: A scientist who studies the possibility of life beyond Earth. They look at extreme places on Earth, study other planets, and help design missions to search for signs of alien life.

SET UP

- There are 15 extraterrestrials in the slide show presentation. Select the ten extraterrestrials that you think your students would most resonate with. Delete the slides for the other five.
- Pass out whiteboards or scraps of paper for each group.
- Pass out "Preconceptions of Extraterrestrial Life" worksheets to each student.

LESSON PROCEDURE

Warm Up

1. Pass out the "Preconceptions of Extraterrestrial Life" worksheets to each student, and bring up the "Sci Fi Extraterrestrials" slide show.
2. Ask the students to turn to the first page of the worksheet and quietly fill out the information as a "bell ringer" activity.
3. Afterward, review the answers as a class to clarify any uncertainties.

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LESSON PROCEDURE

Activity

4. Explain that scientists have not yet discovered extraterrestrial life, but they actively search for it using scientific methods.
5. Divide the students into small groups of 2-4 and begin the slide show.
6. The slide show is set up so that you can view the images, GIF, or video before revealing the name and origin of the creature. After taking a moment to look at the image or video, ask "Do you know the name of this fictional extraterrestrial? What movie, show, or game is it from?"
    - Have students whisper in their groups and write their answers on the white board or a piece of paper.
    - When each group is ready, have them hold up their answers.
7. Click to reveal the name of the creature and their origins in pop culture. You might choose to keep score for each team, depending on your class dynamics.
8. Now that the name of the creature is revealed, ask the following questions, spending more time on the slides that resonate with your students.
    - What else do you know about this extraterrestrial?
    - What interesting features does this creature have?
    - Does this fictional creature remind you of any real-life organisms on Earth?
    - How did cultural factors influence the design of this creature? (For example, the designer's culture, their profession, place they live, their environment, time period, interests, script of the movie etc.)
    - What type of environment do you think this character adapted to?
9. Proceed to the next slide, and read some new facts about the extraterrestrial as a class.
    - Have the students turn to Page 2 of their worksheet.
    - Tell them that they will be working as a group to fill out the sections labeled "Interesting Adaptation(s)" and "Earth Analog(s). They can use the info found on the third slide or prior knowledge about the extraterrestrial.
    - Explain and discuss the terms "adaptation" and "analog."
    - Fill out the first extraterrestrial as a class.
10. Repeat steps 6-9 for each extraterrestrial, with students working in their groups to discuss and complete step 9.
11. There are 4 extra spaces included in the worksheet. As time allows, ask the students if they have any other favorite extraterrestrials they think should be included. This could be part of an extension activity or homework assignment, or explored together as a class.

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LESSON PROCEDURE

Reflection

12. Explore these 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.
    - Do you think that extraterrestrials actually look like what we see in the movies? Why or why not?
    - How have human ideas, experiences, and environments influenced what kind of aliens we see on the big screen?
    - If you were to design an extraterrestrial, how might your culture and background influence what you create?
    - Remind the students that scientists have not found life beyond Earth yet. If a scientist is studying life beyond Earth, but we haven't found life beyond Earth yet, then what could that scientist study in order to better understand extraterrestrial life?
    - How might a scientist looking for extraterrestrials be influenced by their culture, background, or biases?
    - What do you know about the other planets and moons in the solar system? If life exists on these other worlds, do you think it would look like Earth life, or different?
    - What do you know about planets outside our solar system (also known as exoplanets)? If life exists on these other worlds, do you think it would look like Earth life, or different?

EXTENSIONS AND TAKE HOME ACTIVITIES

Here are some additional activities you might consider to extend the lesson or expand learning beyond the classroom.

- Go home and ask their family members what sci-fi extraterrestrials are their favorites. Report back to the class and/or add the extraterrestrial to their worksheet.
- With a parent's permission, find a new sci-fi TV show or movie that they haven't seen before (either from class or a new one). If it's a new extraterrestrial, they can add it to their worksheet.
- Take a poll of family members and their opinions on extraterrestrials. Do they think that there is life beyond Earth?
- Explain to students that a scientist that studies the possibility of life beyond Earth is called an *astrobiologist*. Have students research what types of things astrobiologists study, then share with the class the next day.