LESSON 1: SPACE DETECTIVES - THE SEARCH FOR LIFE

Module 1: **Space Explorers - An Introduction to Astrobiology**

OVERVIEW	This is an introduction to the field of astrobiology. Students challenge preconceived notions of alien life, discuss the field of astrobiology, and decorate "Astrobiologist in Training" stickers. **Duration: 45 minutes.**
SUCCESS CRITERIA	• Students will identify existing knowledge and beliefs about life beyond Earth. • Students will demonstrate an understanding of the basic concepts of astrobiology. • Students can explain what astrobiologists study and what tools they might use.
AZ STATE SCIENCE STANDARDS	Kindergarten • K.L2U1.8 Observe, ask questions, and explain the differences between the characteristics of living and non-living things. There is a wide variety of living things, including plants and animals. They are distinguished from non-living things by their ability to move, reproduce, and react to certain stimuli. First Grade • 1.L4.U3.11 Living things can survive only where their needs are met. If some places are too hot or too cold or have too little water or food, plants and animals may not be able to live there. • 1.L4.U3.11 There are many different kinds of plants and animals in the world today and many kinds that once lived but are now extinct. Second Grade • 2.L2U1.9 Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive. • 2.L2U1.10 All living things need food as their source of energy as well as air, water, and certain temperature conditions.

MATERIALS	• Computer with internet connection and projection (such as Promethean board)
	• Astrobiology YouTube videos for:
	  ◦ K-1 (https://youtu.be/lR64PVA4B3g?si=nUK_X3-atReD9x7u) or
	  ◦ 2nd Grade (https://www.youtube.com/watch?v=eJTfcV1ZceE)
	• Piece of paper, one for each student
	• "Astrobiologist in Training" Stickers
	• Drawing/coloring supplies (such as markers or crayons)

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VOCABULARY	• **Astrobiology**: The science of exploring how life began, how it grows, and where we can find it on Earth or beyond Earth. • **Astrobiologist**: All different kinds of scientists who study how life works on Earth and beyond Earth. • **Alien or Extraterrestrial**: Words used to describe living things that are not from Earth. • **Life forms**: All the different kinds of living things, like animals, plants, and tiny microorganisms.
SET UP	• Prepare YouTube video for viewing. • Divide post-it notes into 10 per student • Place 5 posters around the room with the 5 question cards

LESSON PROCEDURE	**Warm Up (10-15 minutes)**
	• Pass out a piece of paper and drawing supplies to each student.
	• Ask the students to work independently to draw a picture of an "alien." Tell them that there's no wrong answer, it's totally up to them what they want to draw. They can draw an alien from their imagination, or an alien from a movie or TV show, etc. Be careful not to give too much direction at this point.
	• When students have finished, ask a few students to share and describe their drawings and their inspirations.
	• Ask, "What is an alien?" and discuss. For older students, write down some of their ideas on the board.
	• Ask, "What aliens have you seen in movies an TV shows?" If age appropriate, you might choose to bring up images of aliens from popular TV shows and movies. Some well-known aliens include:
	  ◦ Stitch (Lilo and Stitch)
	  ◦ Grogu (Baby Yoda from Star Wars)
	  ◦ The Toy Story toy aliens
	  ◦ Groot from Guardians of the Galaxy
	  ◦ Transformers
	  ◦ Sonic the Hedgehog
	• Ask the students, "Have scientists found alien life?" Explain that they may have heard stories or seen movies depicting aliens visiting Earth, but that scientists don't yet have proof of life beyond Earth.
	• Hang up all students' drawings in the same location in the classroom in preparation for Activity 1.
	
	Activity 1: What is an Astrobiologist? (20-25 minutes)
	• Watch one or both of the following videos:
	  ◦ K-1 Video What is Astrobiology? https://www.youtube.com/watch?v=lR64PVA4B3g&t=11s
	  ◦ 2nd Grade Video What is astrobiology? https://www.youtube.com/watch?v=eJTfcV1ZceE

LESSON PROCEDURE

- Ask students to discuss what they learned about an astrobiologist and what this scientist studies.
- Compare an astrobiologist to a biologist. Biologists study all kinds of life on Earth. Astrobiologists study life beyond Earth.
- Investigate the children's drawings as a class. Note features that are found in common across many drawings, such as eyes, arms, size, etc. Discuss living things on Earth that don't fit this mold.
- For instance, you might say, "I notice a lot of your drawings are drawings of aliens with eyes. Can you think of any life on Earth that don't have eyes?" (Earthworms, jellyfish) "Do you think it's possible that there are aliens without eyes?"
- Another example: "A lot of your drawings have mouths. What living things don't have mouths?" (Plants) "Do you think it might be possible that there is life beyond Earth that doesn't have mouths? Like alien plants?"
- Continue this conversation with any other features you find that a lot of students drew, such as arms, fingers, fur, ears, etc.
- Say, "A lot of your drawings seem to be drawings of big animals, like the size of humans or dogs. Can you think of life on Earth that is much smaller?" (Guide them to think about microscopic life.)
- Explain that astrobiologists are looking for all kinds of life beyond Earth! Just like there are many many different kinds of life on our planet, their might be many many different kinds of life beyond our planet, too!
- This is a good point to tie in some science standards you've been covering in class. For instance, kindergarten teachers might ask, "Do you think that alien life might move in the same way Earth life moves? Why or why not?" A first grade teacher might ask, "do you think there are places beyond Earth that don't have enough water for life, just like on Earth? Do you think alien life could go extinct?" A second grade teacher might ask, "Do you think that there are places too hot or too cold for alien life to survive, just like on Earth? Do you think that aliens need food, just like Earth life?"
- Commend the students for their exploration of astrobiology, and tell them that they are now "astrobiologists in training"!

Activity 2: "Astrobiologist in Training Stickers" (10 minutes)

- Pass out an "Astrobiologist in Training" sticker to each student.
- There is a blank space on each sticker. Depending on time, you might have them fill that blank space with either their name, a picture related to astrobiology, or both.

This module was created by Terra Bennett, a kindergarten educator at Pueblo Elementary in Tucson, AZ, in collaboration with the Arizona Astrobiology Center. It is supported and distributed by the University of Arizona's Astrobiology Center with funding from the Marshall Foundation, Tucson, AZ. For more information, contact Lauren James at laurenjames@arizona.edu. Lesson kits are available for checkout from the Arizona Astrobiology Center. - https://astrobiology.arizona.edu/