

LESSON 2: BEYOND OUR SOLAR SYSTEM



Module 2: **Life in Space: Imagine, Explore, Discover!**

OVERVIEW	In this lesson, students will explore the necessary conditions for life by comparing Earth to other planets. They will design their own planet, based on what they have learned. Duration: 45-70 minutes.
SUCCESS CRITERIA	• Students can describe what living things need to survive. • Students will understand what things make a planet habitable and a good place to live (air, water, and temperature). • Students can describe what is different from Earth to other planets and to see why Earth is special.
NGSS STANDARDS	• K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive. • K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. • 1-ESS1-1 Use observations of the Sun, Moon, and stars to describe patterns that can be predicted. • Crosscutting Concept: <i>Patterns</i>. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them. • Crosscutting Concept: <i>Scale, proportion, and quantity</i>. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance. • Crosscutting Concept: <i>Structure and function</i>. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
AZ STATE STANDARDS	Kindergarten • Science K.EIU1.5 – Observe and discuss patterns related to the needs of living things. (continued on next page)

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AZ STATE STANDARDS	First Grade • Science 1.E1U1.5 – Living things need water, air, and resources from the land, and they live in places that have the things they need. • Science 1.L2U2.7 – Plants depend on air, water, minerals (in the soil), and light to grow. • Science 1.L2U1.8 – Different plants survive better in different settings because they have varied needs for water, minerals, and sunlight. • Science 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. Second Grade • Science 2.L2U1.9 – Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive. • Science 2.L2U1.10 – All living things need food as their source of energy as well as air, water, and certain temperature conditions.
MATERIALS	• Picture of Earth from Space • Picture of the Moon from space • Book about the Solar System (preferably the same one used in Lesson 1) • NASA Kids Video: "What Makes Earth Special?" (https://www.youtube.com/watch?v=YpeUV0HVGn4) • PowerPoint: Imagining Life on Other Worlds (available on AABC website) • Blank paper and coloring implements • Craft supplies (optional)
VOCABULARY	• Planet: A big round object in space, like Earth or Mars. • Air: The invisible stuff all around us. We breathe it in to stay alive, and it helps plants and animals live, too! • Atmosphere: The layer of air that surrounds a planet. It helps protect us and gives us the air we breathe. • Water: The liquid we drink and what plants and animals need to stay alive. • Soil: Soil is the loose upper layer of the Earth's surface where plants grow. Soil is a mix of organic material (decayed plants and animals) and broken bits of rocks and minerals.. There are different types of soil, including sand, and clay. • Survive: To stay alive by having what you need: like food, water, and air.
SET UP	• Write "What Living Things Need" on a white board or poster. Plan to have it up for this lesson and the next lesson (Module 2, Lesson 3) • Set up the YouTube video • Set up PowerPoint (you will use half in this lesson, half in Lesson 3)

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LESSON PROCEDURE

Warm up (20 minutes)

- Say to the students, "Close your eyes and imagine you are an astronaut. You land on a brand-new planet! But wait... can you live there? What would you need to survive?" Pause and let students answer. Write the answers on the board, making sure that the Arizona State Standards (or other desired standards) are included in the list. Depending on the grade, answers might include air, water, soil or minerals (for plants), a source of energy (food/sunlight), certain temperature conditions, etc.
- Show pictures of Earth and the Moon. Ask:
 - "What things does Earth have that helps us live?" Review the list on the board.
 - "What do you NOT see on the Moon?" Review the list on the board, noting which items are NOT found on the moon (no air, soil, water)
- Open the Solar System book you used in the previous lesson, and follow this line of questioning with some of the planets of the Solar System. For instance, you might point out that Mercury is too hot, Pluto is too cold, Saturn has no soil (or any ground at all!), etc.
- Discuss how Earth is the only place scientists have found (so far) that has all of the things that life needs to survive. Earth is special!
- Show the video: "What Makes Earth Special?"
(<https://www.youtube.com/watch?v=YpeUV0HVGn4>)

Discussion: Planets Beyond Our Solar System (10-15 minutes)

- Say to the class, "Close your eyes again and imagine you are landing on another planet. But wait... there's a surprise! There are extraterrestrials living here! What do you think they look like?"
- Bring up the slide show. The first three slides are locations in our solar system. For each world, discuss the challenges that life might have on that planet, and how life would need to adapt to survive there. For instance, for the planet Venus, you might ask,
 - Why can't something live on Venus' surface? (Too hot)
 - How could something live in the clouds? (lightweight, small)
 - What body parts would it need to stay in the clouds? (wings or sails)
 - What do you think such a creature would eat? (lightweight things)
- After covering slides 2 and 3 (Mars and Jupiter's moon Europa), explain that the rest of the slides are real planets outside our solar system (exoplanets). These are NOT real pictures of the planets; the planets are too far away to get a picture. Instead, they are what an artist thinks the planet might look like.
- Do about five more planets as a class, encouraging students to use their imagination to conceive what life might look like on each world, based on the challenges that life would have there. Continually refer back to your list of "What Living Things Need" as you discuss. Save the rest of the slide show for Lesson 3.

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LESSON PROCEDURE

Activity: Create a New Planet (15-30 minutes)

- Say to the students: "Now, we're going to draw a new planet! You can make a planet any way you like! It can be big, small, cold, hot, have lots of water, or be covered in ice - use your imagination! What do you think your planet will be like?"
- Say to the students, "Do you think you want your planet to have life on it? What does your planet need in order to help life survive?" (Refer back to the list on the board.)
- Have art materials available for students to use while creating their planet. Encourage them to think about the different features of planets (e.g., "Will your planet be hot or cold?" "Does your planet have rings like Saturn?").
- While students are drawing/creating, walk around and ask questions like, "What color is your planet?" and "Does your planet have any special features?"
- Optional: Play soft space-themed music to set the atmosphere.

Sharing - Describing Planets (10 minutes):

- After students have finished creating, ask them to share their planets with the class.
- Say to the students: "Now, let's share our planets! Can you tell us what your planet is like?"
- Use sentence starters to help guide their descriptions:
 - "My planet is _____. It is a _____ planet."
 - "My planet has _____. It is _____."
- Encourage students to listen to each other's descriptions and ask questions (e.g., "What is the weather like on your planet?").

Save the planets and the "What Living Things Need" list for Lesson 3.

EXTENSION AND TAKE- HOME ACTIVITIES

- Encourage students to look around their house and find things that help them survive. Look for water, air, and food. Then, tell someone in their family why those things are important.
- Share the slide show link with parents or families, and encourage them to read about these newly discovered exoplanets together.
- "Tonight, draw a new creature that could live on Earth. What features would it need to survive here?"

This module was created by Angela Cisneros, 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/>