

LESSON 3: GETTING READY FOR LAUNCH

Module 4: **Astrobiology Adventures: Plan, Build, Explore**



OVERVIEW	Students will be able to “take off” on their mission! They will work together to uncover their aliens and extreme life from previous lessons on their planet. They will share their mission findings with their other class astronauts. Duration: 45-60 minutes.
SUCCESS CRITERIA	• Students can clearly explain how their discovery aligns with their mission’s original goal. • Students can explain how the discoveries they made on their mission might impact life on Earth or help us better understand our planet or other planets. • Students can analyze how their discoveries could be important for future space exploration.
NGSS STANDARDS	• K-2-ETS1-1: Ask questions, make observations, and gather information to define a problem that can be solved through the development of a new or improved object or tool. • K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function. • 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. • Science and Engineering Practices: <i>Constructing Explanations and Designing Solutions</i>. Use materials to design a device that solves a specific problem or a solution to a specific problem. • Nature of Science: <i>Science is a Human Endeavor</i>. Most scientists and engineers work in teams.

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K-2 AZ STATE STANDARDS

Kindergarten:

- Science (K.L1U1.6): Obtain, evaluate, and communicate information about how organisms use different body parts for survival.
- Social Studies (K.H2.1): Explain the benefits of cooperation and compromise as ways to solve problems.
- Career Development (CD.K.2): Identify different types of jobs and explain why people work.

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.L2U1.8) Different plants survive better in different settings because they have varied needs for water, minerals, and sunlight.
- Social Studies (1.E1.1): Identify different occupations and the skills and education needed for those jobs in our community.
- Career Development (CD.1.2): Explain why people have different jobs and how jobs help the community.

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.
- Social Studies (2.G2.1): Explain how weather, climate, and other environmental characteristics affect people's lives in a place or region being studied.
- Career Development (CD.2.3): Describe how different jobs require different skills and education.

MATERIALS

- Kinetic sand (can also use damp sand or dirt instead) - approximately 2 pounds per group.
- Aluminum tray or sensory bin for sand (1 per group)
- Astronaut figurines (or other small figurines)
- Extraterrestrials and Extreme Life created in Module 2 and/or Module 3 (optional)
- Paper and pencils for note-taking

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VOCABULARY	• Environment: The surroundings or conditions in which a living thing exists, including the air, water, and temperature. • Observation: Watching something carefully and paying attention to details in order to learn more about it. • Extreme Life: An organism that lives in extreme environments, such as very hot, cold, salty, or acidic places, where most living things cannot survive or thrive. • Tool: An object used to help perform a task, such as a brush, magnifying glass, or tweezers.
SET UP	• Put the sand into trays for each group. • If you taught Module 2 or 4, locate the extraterrestrials you created so you can use them for this lesson.
LESSON PROCEDURE	Introduction (10 minutes) • Tell the students that today they are going to land on their planet! • First, have each group review their chosen planet from Lesson 2 and discuss how the conditions on the planet might challenge their landing or their mission goals. • Next, have each group review the mission goals they developed in Lesson 1 so that they will be prepared to carry out their mission when they land. • Finally, have each student review their chosen Space Job from Lesson 1 and discuss with their group what duties they will carry out after landing. Activity 1: Studying the planet's surface (10-15 minutes) • Explain that scientists study the planet from a distance before landing on a new planet or moon. • Ask the students, "What features does Earth's surface have?" (Mountains, valleys, rivers, lakes, canyons, icebergs, volcanoes, oceans, etc.) • Ask them to discuss in their groups what features their planet will have. • After a few minutes of discussion, pass out the trays of sand and have students use their fingers to shape the sand into the features they discussed. • If you have completed Modules 2 or 3 (where students create aliens from clay), pass out the extraterrestrials and have students place them in the environment where they think they might live.

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LESSON PROCEDURE

Activity 2: Landing on the Planet (20-25 minutes)

- Pass out the students' spacecraft, plus one figurine per student.
- Tell the students they need to identify a good landing site. You should discuss what makes a good landing site (flat, no visible life there).
- Tell the students, "After you land, you're going to role-play your job on the planet and study the planet. Like real space explorers, you should study and discover new things about your planet. After you're done, you'll be reporting on your findings."
- Allow the students time to pretend to explore the planet, make discoveries, and study the extraterrestrial life they find. For older children, you might have them document their discoveries as they go.
- Walk around the room, prompting students to carry out their jobs and make discoveries. You might ask questions such as:
 - "What tools are you using to study the planet?"
 - "Are you taking samples? What samples are you collecting?"
 - "Is it hard for space explorers to get around on this planet? Do you need any special tools or protection?"
 - "What kind of atmosphere does this planet have? How does it affect your exploration?"
 - "How do the weather conditions on this planet compare to Earth? Are there any extreme weather events?"
 - "Have you encountered any unusual geological formations? What do they look like?"
 - "How are you communicating with your team? Are there any challenges?"
 - "How are you documenting your findings? Are you using photos, sketches, or written reports?"
 - "What challenges have you faced during your exploration? How are you overcoming them?"
- Invite the students to dive deeper into their study of the life on their planet (and touch on Arizona Science standards) by asking them questions such as:
 - "What life are you discovering on the planet? How is it different than Earth life?"
 - "How do the alien life forms use their body parts to survive on this planet?"
 - "What special features do the alien creatures have that help them live in their environment?"
 - "What resources do the alien life forms need to survive? Do they need water, air, or something else?"
 - "Where do the alien creatures live on this planet? What do they need from their environment?"
 - "Do different alien plants survive better in different parts of the planet? Why?"

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Module 5: **Astrobiology Adventures: Plan, Build, Explore**



LESSON PROCEDURE

- "What do the alien plants need to grow? How are their needs different from Earth plants?"
- "What energy sources do the alien life forms need to survive?"
- "How do the alien creatures get air, water, and maintain the right temperature?"
- "What do the alien life forms eat? How do they get their food?"
- "What other conditions do the alien creatures need to survive?"

Mission Report (10-20 minutes)

- Have each group of students report on their mission. You may want to guide their presentation by having them answer the following questions:
 - What are the conditions on your planet? (Atmosphere, weather, surface)
 - Did you find any life on your planet?
 - How did life survive in your planet's environment?
 - Were there any challenges to your mission?
 - What did you do for your jobs? How did your job help fulfill your mission goals?

EXTENSIONS AND TAKE HOME ACTIVITIES

- Show students these NASA-created [Space Tourism Posters](https://www.jpl.nasa.gov/galleries/visions-of-the-future/) (<https://www.jpl.nasa.gov/galleries/visions-of-the-future/>), then have students design a poster advertising their planet as a vacation destination.
- Ask students to write a short story about the adventure of finding their alien or extreme life, including where it lives and what it does.
- Have students do a "Gallery Walk" to tour the different planets, with one student in each group staying behind to present and ask questions while the others rotate through and see other worlds. Make sure each student in the group gets a chance to present and see the other planets.

This module was created by Lauren Bollinger, an elementary school educator at Bloom 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/>