

LESSON 2: HORTON HEARS A WHO



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

OVERVIEW	This lesson uses the children's book, <i>Horton Hears a Who</i> by Dr. Suess to explore fundamental astrobiology concepts. In this lesson, students will explore the possibility of life existing on scales and in environments different from our own. Students will consider the diverse forms life might take and how they could adapt to extreme conditions. Through questions inspired by the Whos' tiny world in <i>Horton Hears a Who</i>, students will think about the challenges of detecting and communicating with extraterrestrial life and explore the tools and methods scientists use to search for evidence beyond Earth. This unit fosters critical thinking about the definition of "life" and the importance of preserving potentially habitable environments, emphasizing that even the smallest forms of life hold significance in the vastness of the universe. Duration: 45-60 minutes.
SUCCESS CRITERIA	• Tool Usage: Students can correctly use tweezers to grasp and retrieve plastic organisms. Students demonstrate safe and controlled handling of the tools. • Organism Location: Students can systematically search in Pluffle or sand to locate the hidden life. Students retrieve at least a set number of the hidden organisms. (This number can be adjusted based on your students.) • Organism Identification: Students can accurately describe the characteristics of the plastic organisms (e.g., shape, size, color). If applicable, students can name the organisms. • Fine Motor Skills: Students demonstrate improved fine motor skills through the precise movements required to use the tweezers. Students demonstrate hand eye coordination. • Observational Skills: Students demonstrate careful observation as they search for and identify the organisms. Students can communicate what they see.
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-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but exactly like, their parents. • 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>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.

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AZ STATE 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

- Horton Hears a Who: book or Youtube video such as <https://www.youtube.com/watch?v=AjsFA4l4tPc>
- Sensory bins (plastic bins or aluminum baking pans)
- Pluffie, sand, or dirt
- Science tools, such as tweezers, beakers, petri dishes, spoons, and magnifying glasses
- Microscope camera (optional)
- "Alien Organisms" for locating in the pluffie or sand. You have several options for this:
 - If you are borrowing a kit from the Astrobiology Center, 3D printed organisms have been supplied to you.
 - Recruit an older class to create small alien creatures out of air dry clay (they might do it in conjunction with an Astrobiology Center lesson!).
 - Complete Module 2, Lesson 3 or Module 3, Lesson 3 prior to this lesson, and use the clay aliens your students create. (It's okay to do them out of order!)
 - Purchase small plastic animals from the store. Consider including other random items such as buttons, balled up foil, a pen cap, etc.

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VOCABULARY	• Environment: A place where something lives. • Organism: A living thing. This could be an animal, a plant, and more. • Microorganism: A very tiny living thing that you can't see unless you use a special tool called a microscope. • Habitable: A place where something can live happily - like how Earth is a good home for people, animals, and plants.
SET UP	• Add about 10 different organisms to each sensory bin. • Fill each bin with 2-3 inches Pluffie or sand to cover the organisms. • Set up science tools around each sensory bin • Set up the microscope camera (if applicable) Note to Teacher: If you are checking out the kit from the Astrobiology Center, there are 10 sensory bins provided so that students can do this activity in groups. If you are gathering the materials yourself, you can create just 1-2 sensory bins and utilize the extension activities below to engage the other students while they wait for their turn with the bins.
LESSON PROCEDURE	Introduction (20-30 minutes) Read Horton Hears a Who aloud, or watch a Youtube video of someone reading the book. During the reading, pause frequently to highlight and emphasize the following concepts: • Size and Scale: ◦ When Horton first hears the Whos, emphasize how incredibly tiny they are. Use phrases like, "Smaller than a speck of dust!" or "So small, you could barely see them, even with a magnifying glass!" ◦ Connect this to the idea of microorganisms: "Think of the tiniest bugs you've ever seen, or even smaller things we can't see with our eyes. That's how small the Whos are! Scientists call those tiny living things 'microorganisms.' Organisms are all living things, and 'microorganisms' are the tiniest of living things!" ◦ Use hand gestures to show the difference between "big" (Earth) and "tiny" (the speck of dust). • "Habitable" Environments: ◦ When describing the Whos' world, ask: "What do you think the Whos need to live on their speck of dust? Do they need air? Water? Food?" ◦ Relate this to planets and moons: "Just like the Whos need a 'home,' scientists look for planets or moons that might be 'homes' for extraterrestrial life. They look for places with things like water and air." ◦ When Horton says "a person's a person no matter how small" emphasize that even if we find the smallest living thing ever, it is still important.

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LESSON PROCEDURE

- Imaginative Thinking:
 - When Horton talks to the Whos, ask: "What do you think the Whos' city looks like? Do they have houses? Cars? Schools?"
 - Emphasize that we don't know what life on other planets might be like: "We're using our imaginations, just like scientists do! They try to imagine what life on other planets might be like, even if they don't know for sure."
 - "Do you think they have pets? What kinds of pets would they have?"
 - "What kind of food do you think that they eat?"
- Communication:
 - When Horton tries to make others hear the Whos, ask: "How could we help the Whos be heard? What if extraterrestrial life forms used different sounds or signals than us?"
 - "What if they talked in colors? Or smells? How would we know what they were saying?"
- Playful Engagement:
 - Use silly voices for the Whos and Horton.
 - Encourage students to make sounds like the Whos.
 - Have them act out scenes from the book.

Activity (20- 30 minutes)

1. Tell the students that they are now going to pretend to be an astrobiologist. Astrobiologists are looking for life beyond Earth, such as other planets or moons, but we haven't found life beyond Earth yet. So, astrobiologists also study life on Earth, such as microorganisms, to learn more about what life is and all the different types of life that could exist.
2. Show them one of the sensory bins and the science tools.
3. Demonstrate "discovering" an organism in the Pluffle and using the science tools to study the organism. The Pluffle acts as a loose, easily sifted "substrate" or "soil," mimicking the process of uncovering fossils or organisms in a natural environment.
4. Divide the students into groups to explore the sensory bin. Encourage them to talk like scientists, sharing their observations and new discoveries about the creatures as they study them.
5. For older or more advanced children, you might consider having them take notes of their observations, or focus deeply studying one particular organism in the bin. For younger children, they can name the organisms with real or imaginative names.

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LESSON PROCEDURE

Discussion/Reflection (5 minutes)

- After the activity, you might invite students to share their findings and answer questions such as:
- What new organism did you discover today?
- What observations did you make about your organism?
- Which organism was the most interesting?
- Were there any that you didn't recognize?
- How were you pretending to be like an astrobiologist today?

EXTENSION AND TAKE-HOME ACTIVITIES

- "Speck of Dust" Exploration (if not doing this activity in Lesson 3):
 - Have students collect samples then examine them together using a microscope camera (sand, leaves, etc.).
 - Ask: "Do you see anything tiny? Do you think any living things could live in these tiny spaces?"
- Extraterrestrial City Drawing:
 - Have students draw their own versions of the Whos' city.
 - Encourage them to add details about what the Whos' lives might be like.
- "Extraterrestrial Communication" Game:
 - Play a game where students try to communicate using only gestures or sounds, like extraterrestrial life forms might use.
- "What If?" Questions:
 - Continue asking open-ended questions: "What if there were tiny living things on Mars? What would they look like? How would they live?"
 - "What if we found a planet that was made of jello? What kind of life could live there?"
- Backyard Biologist (At Home Activity, worksheet available on AABC website):
 - Students can explore in their backyard/neighborhood
 - They can draw or photograph what they find and describe their observations, just like scientists do!

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/>